COMPUTING AGE

JANUARY 1986 £1.00

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- MAKING MUSIC IN FIVE BASICS
- MANDLEBROT MATHEMATICS
- PRESTEL BACKWATERS

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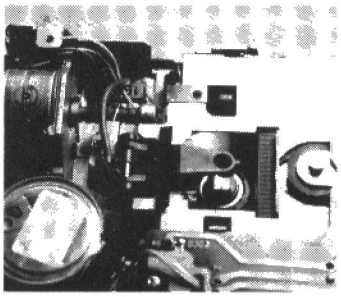
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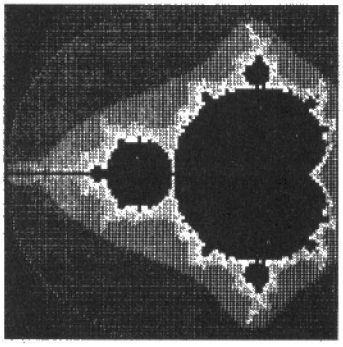
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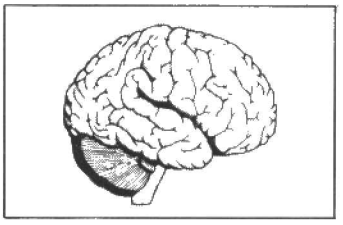
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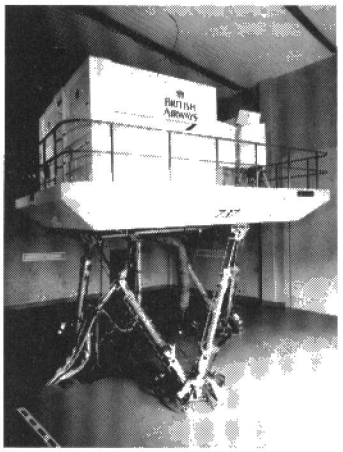
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Why e-mail won't work

A recent survey amongst a random sample of *The Times* top 1,000 companies revealed some interesting information about the usage of and attitudes to electronic mail within industry. Of the companies surveyed, half have not yet considered using electronic mail, and by far the largest proportion of those that did use an e-mail service were controlled from overseas.

Telecom Gold was found to be the most popular of the proprietary systems with TG and Prestel being the best known services. The major use for e-mail was for the transmission of memos followed by letters and documents. The main advantage of e-mail was said to be speed while the major problem cited by the companies was in the training of staff. It will surprise few people that the report indicates that in-company use of e-mail is much greater than inter-company use. The reason for this has little to do with users' attitudes to e-mail but the way in which the services have grown up in the UK.

Prestel was one of the first e-mail services but this system doesn't facilitate the ready interchange of e-mail items. The mailbox frames are restricted to only a few characters, which makes sending messages of anything over a few words a tiresome affair. It was to provide a means of sending ASCII based text files of more reasonable length that services such as Telecom Gold were launched. At present there are a number of these services available to the businessman: TG, One-to-One and Easylink are the leading contenders.

Having selected a system to join, a company, while gaining access to the e-mail community, will be restricted to sending mail only to those subscribers of the particular service they have joined. For a variety of reasons, mainly commercial but also technical, it is not possible to exchange e-mail documents between, for example TG and One-to-One.

It is easy to see why Telecom Gold, the market leader, would be reluctant to set up recipricol arrangements with the other services. As market leader TG would find it difficult to commercially justify opening up their large subscriber base to the users of other services. Even if there was to be an agreement to link up the various services there would be a host of difficulties concerning revenue share to be sorted out.

The *Electronic Mail* report is available from James R Adams & Associates Limited, 5 Langley Street, LONDON, WC2H 9JA. Single copies cost £172.50, second and subsequent copies are £86.25.

NEXT MONTH

Extending Amstrad

Our program listings pages this month demonstrate that the Basic command set of the Amstrad computers can be extended by using Z80 machine code. Next month Richard Sargent builds upon this idea with a further suite of additional commands.

Look to the stars

We turn our gaze towards the heavens to examine the UOSAT project, based on two satellites launched as part of the University of Surrey's Educational Satellite Project.

Let the buyer beware

What steps can the mail order customer take to ensure that they don't suffer if a company goes bust before the goods are delivered? We have a plain man's guide.

ON SALE JANUARY 13

Contents subject to late revision.

For more details of the February issue turn to page 41.

Old bugs for new in reconstituted Gem

A few cosmetic changes and an undisclosed sum of money has settled Apple's claim that Digital Research infringed its Macintosh copyright in the GEM operating environment.

GEM was deemed to be too alike to the original Mac windowing system. The new version, revealed in London in November, has desktop menu on the right instead of left of the screen, and has dispensed with the 'close window' boxes. Now, in order to close a window, a pull-down menu must be accessed. Other changes are of a similar minor nature.

But problems still dog the GEM system. Programmers say that, whilst the system may be user friendly it isn't friendly to them. One software house claims that the new GEM has a few brand new bugs to replace the many old ones they had already got used to; that it is impossible to make GEM multitask because it is so badly written; that TOS, the core of GEM, is still desperately slow; and that GEM Write is nothing better 'than VolksWriter with WIMPS' – also slow and only one font.

Add to this the problem that it takes six calls to ROM in GEM to do the same as one call to ROM on the Mac, and it is a wonder that so many houses are writing and transferring software to the new window environment. But there are, and they believe that GEM will be a success, particularly on the IBM PC and, if it ever takes off, the Atari 520ST.

Dreadful secrets of the computer age family

Families owning home computers are facing a 'computer generation gap' according to a MORI report published recently by Enterprise Computers. Most Computer-owning parents have never used their computer and less than one in ten believe they know more about their computers than their children.

Lack of parental control or awareness of the activities of the new 'computer kids' could spawn a generation of software pirates according to the report.

The nationwide survey quizzed 329 computer-owning children aged between 13 and 17, and 201 parents with chidlren of the same age-group and a computer in the home.

Disturbing findings from the survey were the levels of ignorance among parents of what children do with computers at school.

The survey also suggests there may be a buying boom around the corner. (luck for good old Enterprise – Ed). The vast majority of those questioned owned computers recognised to be 'out of date'.

On a brighter note the survey found that the majority of kids and parents would like to do more programming on their computer.

Over 80% of parents said they would use computers more for practical uses such as paying bills, storing recipes, shopping lists and accounts.

For the record here are some of the highlights of the report.

Parents are out of step: over half (53%) have never used their computer. And less than one in ten believe they known more than their kids.

School: teacher knows best, but less than half the kids find computer lessons 'fun'. Only 54% use a computer at all at school.

Pirates: a quarter of kids use illegal copying as their most favoured way of obtaining programs.

Programming is boring: the vast majority of children and parents 'play games' on their computer. Fewer than one in five are involved in programming.

Boys vs Girls: computers are 'sexist'. Boys use them more at home and at school than girls.

Problems, problems: almost one in three parents has had to return a faulty machine

Multi-million software scheme for schools is 'unrealistic incentive'

In what appears at first sight to be an invaluable boost to the software industry, the Government has launched a scheme aimed at promoting the sale of commercial software to schools, whilst improving the range and quality of programs available to students at both secondary and primary level.

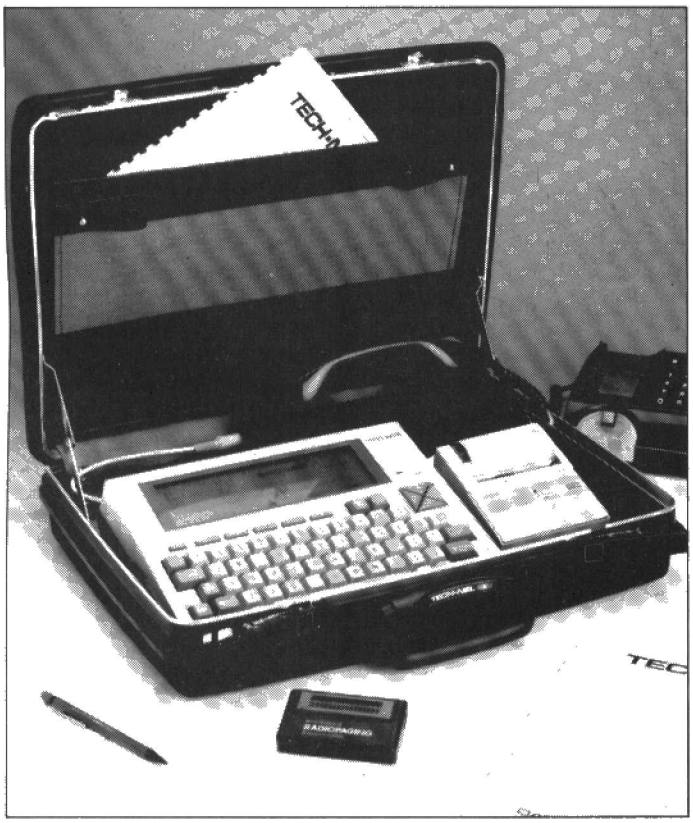
Following on the Micro-Electronics Programme for schools, which ends in March 1986, comes the Software Support (SS) Scheme, which was launched on October 1st 1985, and will operate for the next three years.

MEP subsidised the purchase of micro-computers by every secondary and primary school in the country over a period of about four years. The SS scheme is intended to give Local Education Authorities the chance to buy subsidised software for their schools, to help make best use of that hardware, courtesy of a £3.5 million grant from the Department of Trade and Industry. The conditions of the grant are that the money be used solely for the purchase of serious software for educational, not administrative, use in schools, that it must be commercially available software which is bought and that in years two and three of the scheme the LEAs must match the DTI's grant, pound for pound, with money from their own resources.

One of the aims, says a spokesman from the Department of Trade and Industry's Education Unit, is to build on commercial products, which at present benefit from schools only by £1-2 million per year, creating a bigger selling base which will make it worthwhile for companies to invest in the educational software market. The scheme is also designed to take account of the fact that as children learn, so they require a steady and increasingly sophisticated type of software program, a factor not adequately catered for by school capitation allowances.

According to the DTI, the project has been met with acclaim by the software industry, and will do much to encourage small companies to enter the serious software arena. The details have been worked out in conjunction with the Local Education Authorities, and future developments will depend on initial results as well as on whatever funds may become available from Government sources.

A closer look at the scheme, however, reveals that all may not be quite as it seems. Criticism has already reared its ugly head. Shirley Williams, one-time Minister for Education during the Wilson regime, has had the bad taste to point out that merely promoting sales is less impressive than funding specific software development, and some of the commercial producers have taken time off from being delighted about it to ask whether £3.5 million over three years, spread between every LEA in the country, is actually going to amount to much in terms of realistic incentive, particularly when the bulk discounts demanded by Education Authorities are taken into account.



Calling all Action Men. The lastest in what we might call VAH (Value Added Hardware) is the AMK1 which stands for – you guessed it – Actiion Man Kit. The back room introverted computer enthusiast may not appreciate this boon to the man on the move, complete with NEC portable computer, printer, modem and radio pager. Add up the price of those and, with the whole package priced at £1000, the briefcase might seem a little expensive. Contact Tech-Net 0295 65781.

Philips first with CD ROM

Philips claims to be the first manufacturer to go into full scale production of a compact disk ROM.

Designated the CM-100 the optical storage system has been in volume production since last June. Among its key features are a 600Mb data capacity per single sided disk, random access and high data integrity. The drive uses 120mm disks on which data is recorded to the joint Philips/Sony format CD ROMs.

Initial production versions of the CD drive have been allocated to a 'major computer manufacturer' but the drives should find their way into other equipment in the near future.

Amnesty for WordStar pirates

In a surprise move prompted by the Copyright (Computer Software Amendment Act, **MicroPro** has granted an amnesty to users of pirated copies of WordStar, the best-selling wordprocessor package.

On payment of £40 an illicit copy of WordStar becomes a bona fide product and the owner can receive the usual updates and exchanges, and stop worrying about the **lawyers** knocking on the door.

There are currently 1.5 million legitimate copies of WordStar in use in the world today, and an estimated 85,000 in the UK. MicroPro believes that there are four times that many **illegal** copies in use, many in large companies where users backed up colleagues' copies.

The new amendment to the Copyright Act is expected to give software companies considerably more clout in the fight against piracy, and MicroPro is attempting to give the casual copier a chance to **come clean** prior to enforcement. Large scale pirates, says MicroPro, will be deterred by the £40 purity plea. The unprecedented offer will have the further advantage of recouping for MicroPro a proportion of lost revenues.

The offer is expected to run out in Spring 1986. At this time there is no evidence as to how successful the campaign will be or of what effect it may have on the value of legitimate WordStar products, however other large software companies will be watching with interest.

Small time outlaws can rehabilitate themselves by returning the disk with £40 one-time licencing fee to *WordStar Amnesty, MicroPro (UK) Ltd, Haygarth House, 28/31 High Street, Wimbledon Village, London SW19 5BY.*

Acornsoft launches have no big surprises

There are three new software releases from Acornsoft this Christmas, but no big surprises for BBC micro owners.

Anyone hoping for another Elite-style blockbuster from Acornsoft this Christmas is likely to be disappointed, because there isn't one. Of the three new releases from the company only one is games-based.

There's an upgrade of the successful VIEW word processor, a new MicroProlog language for the Beeb, and on the games side the launch of 'Revs 4 tracks' to cash in on the steady sales of the simulator.

Revs has already proved itself an exceptional game in terms of its screen graphics, competitive spirit and accuracy of simulation. It's based on qualifying and racing on the Silverstone race track from the driver's seat of a Formula 3 racing car. Now four more British racing circuits are available in the Revs 4 tracks pack: Brands Hatch, Donnington Park, Oulton Park and Snetterton; and these can each be loaded in by the Revs program to increase your driving experience. The new cassette costs £9.95, while the disk sells for £12.95.

MicroProlog, the programming language in this trio, has already created quite a stir on a number of machines including the Sinclair Spectrum, and is seen as the great white hope in some educational circles. Although normally very heavy on memory, Acornsoft's version comes in a 16K ROM.

MicroProlog is chiefly thought of in the context of artificial intelligence, and like LISP it is heavily biased towards the handling of related data, making it perfect for writing expert systems and databases with the minimum of effort. Its usefulness extends to models and simulations of the real world and, in lighter vein, complex adventure games. MicroProlog was written for Acornsoft by Logic Programming Associates of London, who also wrote the Spectrum version, and it is compatible with nearly all the available books teaching the language. The ROM, reference guide, and a disk containing various 'front ends' and an example program cost £79.95.

VIEW has been revised and re-launched as VIEW 3.0, this time incorporating the Printer Drivers and Printer Driver Generator program necessary to obtain bold and underline effects from the wordprocessor. These were previously available as optional extras, and the price of the whole package has been upped by just under £30 to £89.70 to cover the extra software and a number of small improvements to the basic system.

It sounds a lot, but the increase is worth it, as the improvements have certainly made VIEW much nicer to use. For example, refinements have been made to cursor movement and text formatting making them much more logical, highlight characters are now shown in reverse display making them easier to spot, and at last the COPY key actually does copy marked areas of text.

Screen re-drawing while scrolling has been speeded up slightly, and there are a few new commands. One assists in setting VIEW's format, justify and insert/overtype options, from an EXEC file, while another allows the naming of a current file, removing the need to continually type it in when saving to disk or tape.

Reading and screening operations are now better suited to telecommunications use, and the 3.0 version also re-locates automatically to the top of memory if used with the 6502 second processor, giving about 47K of text storage in any screen mode.

If you already own VIEW 1.4 or the more recent 2.1 or Hi-VIEW, there is no need to tear your hair out! You will be pleased to hear that an upgrade facility now exists at Acornsoft. Send in your old chip (or disk if you use Hi-VIEW), together with a cheque for £23.00, to receive the new VIEW 3.0 ROM, a reference card and the slightly amended function key strip supplied with the program. If you also want a copy of the new (completely re-written) manual, enclose an extra £10.00.

Acornsoft's business manager Rob Macmillan is hoping to encourage lots of people with earlier versions of the software to upgrade, and make 3.0 the new VIEW standard.

Further details from Acornsoft Ltd, 645 Newmarket Road, Cambridge CB5 8PD Cambs. Tel: 0223 214411.

Phone conversations with a hard disk system

The crucial step in what promises to be a whole new branch of the broadcasting industry using hard disk-stored voice data was taken last month with the appearance of Mainline, the first independent company to link into British Telecom's new Premium Rates Local Services Exchange (PRLS) at Kingsland Green in Islington.

Londoners dialling the 0066 PRLS exchange are automatically charged as if for a national B rate call to, say, Sheffield. Part of the surcharge is passed on to companies who provide services through the exchange – thus making dial-up services commercially viable for the first time.

British Telecom plans to expand the system to "major urban areas of Britain" sometime next year.

The first organisation to take advantage of this new exchange was established by BT some months ago, thus providing BT with a kick-back over and above the normal call-generating motive behind such venerable services as Dial a Disc and the Speaking Clock.

Ironically, the technology involved is remarkably straightforward, raising the question of why – once again – BT has managed to be decades behind the US in this field, as in the provision of toll-free calls. Indeed, the Islington exchange is an archaic mechanical device, converted to the new service after being made redundant from its regular exchange work by a more modern unit, and does little more than add a trunk charge to all incoming calls.

A 4 kilometre dedicated data line joins Islington to the Mainline offices in Farringdon, where it encounters our first bit of late twentieth century technology – a BT-manufactured Talon device, within which a hard disk stores up to 4 hours of digitised audio information.

Talon registers the digits dialled by the subscriber and selects from the hard disk the first part of the file associated with those numbers. This data is loaded into RAM and fed down the dedicated line to Islington where a digital to analogue converter transforms it to an audio signal for dispatch to the subscriber. As the call progresses, further sections of the file are read into RAM and dispatched.

The whole process of data handling is so swift that the caller doesn't hear the joins, and – with an appropriate configuration of the Talon equipment – an unlimited number of simultaneous callers can be served, each hearing the recorded information from the beginning.

A cheap and dirty option on the Talon exchange allows for the silicon equivalent of a continuous tape loop; many callers can be linked to the same Talon port, but they risk joining the recorded message somewhere in the middle.

Mainline reckons to be focussing on the mass market with its selection of services. Fishing Line (0066 11155) provides weekly info on where the fish are jumping around London; Laugh Lines (0066 3333) has three minute extracts from the capital's alternative comedy scene; the Virgin Megaphone (0066 11167) carries interviews and song extracts from stars of the Richard Branson empire, with other pop stars on Chartbusters (0066 2222), and the topical Comet Call on 0066 11111.

A full menu on 0066 6666 has details of other services.

Letters

Send your letters to The Editor, Computing Age, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU.

IV opportunity

Sir,
As an Interactive Video (IV) producer I would like the chance to reply to your article 'Interactive Video – A Lost Opportunity'. You stated that as far as the British are concerned IV is merely an expensive hobby. This is true in the case of the domestic market, probably due to the high cost of videodisc players, but is certainly not true of the industrial market. In fact, the major videodisc player manufacturers have changed their marketing policies to aim almost totally at the industrial market.

The three main areas where IV is being used are Point of Sale, Training and Information storage.

A point that may be more relevant to your readers is that IV does not have to be disk based. it is quite possible, and much cheaper, to produce programs using video tape. If any of your readers have a microcomputer and video tape machine with a 'hard-wired' remote control, they might like to see if they can control the player from the computer. Inexpensive authoring systems are available for the BBC micro which make the production of IV programs simple.

Finally I would like to congratulate you for producing a most readable magazine.

N. P. S. Brooks
Box, Wilts.

Leeds BB

Sir,
I have recently started a Bulletin Board system in Leeds (called 'Grendel') and would be grateful if you could give it some publicity. Information on the BB is also available on Prestel page 32300092.

The BB runs my own software (ABBS) on a BBC micro plus 6502 2nd processor. There is currently room for approximately 700 users. Each user requires a 'usercode' (similar to the mailbox numbers on BT Gold). This can be obtained via me on Prestel, or by using the demo usercode 'DEMO' on the BB and then the register command.

The BB is mainly for those people interested in computing/networks/PSS/information technology etc. but not games or MUD.

Private (user to user) and open electronic mailing is supported with a number of special interest groups (SIGs). There is also a lot of files that may be read containing news and information.

The BB operates at 1200/75 baud with 8 data bits and no parity. Terminal software should be scrolling *not* Viewdata. The number is 0532 620334, and operation is usually 7 days per week between 9.00 pm and 8.00 am. Please do *not* call outside these times.

Michael J. Tubby (Sysop)
26 Oak Road, Newton Park, Leeds.

Sell it

Sir,
I am the owner of an Amstrad CPC 464 computer and am anxious to extend its capabilities. I would appreciate your advice on the following matter.

Would you advise how I can upgrade my computer from 64K to 128K to reflect the 6128 system switch banking. I have the facilities of a good electronics engineer to assist with your instructions. I have already considered, and rejected, the option of sale of my 464 and re-purchase of a 6128.

M. Mason
Droitwich, Worcs.

Unfortunately we doubt that conversion of a CPC464 to a 128K machine offering the facilities of a CPC6128 is a practical proposition. In addition to carrying out the hardware modifications, in itself a difficult task, the firmware of the CPC464 would not be compatible with the expanded machine.

Amstrad has made it clear that they are unwilling to help people with upgrades and without their co-operation in supplying technical details and revised firmware it is unlikely that the modification is possible.

We can only suggest you reconsider the sale of the CPC464.

QShell

Sir,
I am writing to inform readers of *Computing Age* of the current progress of QShell, the QDOS shell for the Sinclair QL which first saw the light in the pages of *Electronics and Computing.*

Unfortunately there have been insuperable development problems, caused initially by the unavailability of third party hardware, and I have had to suspend the project, hopefully temporarily.

However, if anyone would like to obtain the latest version of the source code and an implementation note, they should write to me care of *Computing Age,* enclosing a stamped addressed envelope and two Microdrive cartridges.

Adam Denning

PCW interface

Sir,
The Amstrad PCW8256 is an excellent package, but the control for the printer is contained with the computer. It is a very good printer and it is a pity it cannot be used with other computers.

May I suggest that a first class project for your magazine would be an interface to enable the Amstrad printer to be connected to any computer with a Centronics or RS232 output.

D. A. Muret
Solihull, West Midlands.

Nothing in it

Sir,
It was refreshing to see at least one article on DRAGON subjects, in your December issue, even if this was written by someone who apparently does not know how to adjust his video monitor correctly. Perhaps Compusense was to blame and not yourselves, but they should know that the on-screen script of the Dragon is steady and easy to read without the eyestrain associated, for instance, by the awful BBC-B display. I have both models.

I normally have had to announce to the fifty or so members of my group that 'There is nothing in *Computing Age* for us this month,' as most of the Radio Amateur/Computer addicts in the East Midlands are devoted to the Dragon, which is so simple to use for the transmission and reception of data over the air, without any expensive add-ons, modems, or the like.

When you do publish the occasional circuit for simple add-ons, would you please bear in mind that the people most likely to use a soldering iron intelligently are the 60,000 licenced Radio Amateurs, many with Dragons . . . How about a real-time clock add-on (cartridge slot, please), soon?

Hoping that in 1986 I shall be able to say, 'get *Computing Age* this month' to my members, and with sincere wishes for your success.

R. A. Davis G3RLO
Hon. Sec. Dragnet

Our references to the poor quality of the Dragon's video display referred to the software-generated 51 column mode used when running applications software under either the FLEX or OS9 operating systems.

The standard hardware generated 32 column screen is, we agree, rock steady. It is however too restricted for many applications, eg. word processing. The Compusense Expansion System allows users to enjoy the best of both worlds: a clear, well defined 80 column display.

Competition

The 'Win a Penman Plotter' competition in our November 1985 issue attracted a good response. The winner of the Penman Plotter was Michael Holloway of Stourbridge. The ten runner up prizes of a six month subscription to Micronet were M Fairbain, A Barnard, S Ellis, B Barwick, S Rainbury, M Alexander, G Isaac, C Little, T Ward and P Dyer.

TAPPING THE PUBLIC DOMAIN

Drastic changes in the computer market and amnesties for pirates shows that shareware makes sense. Simon Craven examines the pros and cons of the (almost) free software market.



Have you ever wondered why all the decent software for your shiny new CP/M Amstrad costs as much as the computer itself?

If you are a programmer, you will be painfully aware that the skill and effort which goes into a top-notch computer game is just as impressive as the amount of time and trouble that goes into a spreadsheet program or wordprocessor. Yet there are very few games costing over £25 and a business package for CP/M or MS DOS costs hundreds.

As with most elements of the computer culture, the concept of really cheap serious software is most widespread in the US, where there is a widely encouraged 'public domain' of information which is freely available to anyone who asks. In America, for example, all governmental information is available unless it is specifically made secret, whereas in this country it often seems that the opposite applies. Like most American trends, however, the idea that software should be affordable is spreading across the Atlantic just in time to match the demand created by the low-cost computers now appearing.

The British computer user is not tuned into the idea of getting usable software for free, taking the attitude that if it doesn't cost a small fortune it can't be any good. The only time he thinks he's beaten the system is when he pirates a copy.

The disadvantages of this approach are many: no documentation, no help if anything goes wrong, no upgrades, no patches to correct bugs, a sense of guilt and the possibility that you might just get caught one day.

Having said that, the remarkable news is that the UK branch of Micropro has just announced a complete amnesty for anyone in possession of a hot copy of Wordstar. Versions of Wordstar have been ripped off for years by absolutely everyone who has anything to do with personal computers; it became the best-selling CP/M word processor and the MS DOS/PC DOS version also sells well. However, the number of illegal copies far outnumber the legitimate versions.

The prices charged by most software companies producing serious applications programs and utilities for machines like the IBM PC, Apple family and CP/M systems tend to be based on 'perceived value'. That is, they try to figure out how much the typical user will think this piece of software will make or save him or her, and set the price at a hefty percentage.

Consequently there is a big shortage of capable software at reasonable prices for home users of high-performance business-style micros. Adam Osborne, free marketeer and iconoclast of the personal computer business, intends to plug the

gap for IBM PC compatible computers at least, with his Paperback Software range which includes among other shockers a pretty fair word processor for £33.80, and a cheap Lotus 1-2-3 lookalike in the works.

Osborne's buzzword is 'cost-related' pricing. He claims to work out what it actually costs him to produce a copy of Paperback Writer, package it in its integral wrapper-cum-manual and send it to a Bookstore Near You. He then adds a resonable percentage to provide for a bit of profit and that's the price you pay. Revolutionary!

PUBLIC DOMAIN

There are plenty of other ways to get hold of good software legally without paying an arm and a leg. These include public domain software, which is usually to be found on electronic bulletin boards or networks (alas, mostly in the US).

Public domain software is free, donated to the general public by its authors for whatever reasons they think fit. However, to be strictly accurate, this doesn't mean you will be able to get it without incurring any costs at all. You have to spend time looking for the right program, buy the disk or disks on which to store it, maybe photocopy a manual or (more likely) print out a READ.ME text file at your expense. On-line time to a bulletin board from which you can download software is not cheap either.

To make themselves a small amount of money, and provide a useful service at the same time, a number of American software houses spend their time ferreting out the most useful programs and assembling them into volumes on disk. A number of user groups, computer clubs and the like do the same thing, but buying from a company tends to reduce the time you waste sorting out the wheat from the chaff. CP/M users may be familiar with the disk anthologies of Workman and Associates; their six collections include material which is available from other sources, but the quality of the software they supply is consistently excellent. At £32.50 per disk their prices are thoroughly reasonable.

Although sourcing a supply of public domain software from reputable sources such as national user groups should eliminate any programs with dangerous tendencies, you can't be too careful. These programs are gift horses which should definitely be looked in the mouth. Many come with no documentation at all, and each should be treated with grave suspicion until proved innocent. That way, if something you thought was a spelling checker turns out to be a hard disk formatting program, you'll be ready for it. In case you're wondering how such a devastating confusion could arise, remember that there is nothing holy about filenames and (accidentally or deliberately) turning a file called HDFORMAT.COM into one called SPELCHECK.COM is as easy as a RENAME command. You don't know where these programs have been, so watch out.

SHAREWARE

The next step up the ladder from public domain software is a concept variously entitled 'freeware' or 'shareware'. A classic example of this is a highly-rated, though fairly basic text editor/word processor called PC-Write. The author, Bob Wallace, decided that marketing yet another wordprocessor for the IBM PC in the conventional way would involve a lot of time, expense and bother. Furthermore, as someone who had suffered by buying badly-written software at inflated prices he didn't want anyone to buy a copy of PC-Write unless they really liked it and thought it was worth the money.

In his native US, to buy a copy of PC-Write the purchaser either writes to Quicksoft enclosing $10 for a disk and postage, or copies a friend's disk. This is entirely legal, decent, honest and truthful. When it arrives, you play around with it, and, if you think it is worth the money, send Quicksoft $75. This entitles you to a proper printed manual, support by phone, and information on updates as and when they arrive. An owner even gets a commission payment if anyone they give a copy to subsequently pays the $75. However, there is no obligation to spring the extra if you don't want to: no black Cadillacs containing teams of lawyers will draw up outside your house.

'There is no obligation to pay for PC-Write. No black Cadilacs containing teams of lawyers will draw up outside your house'

It is tempting to compare the PC-Write story to that of the Wordstar amnesty, which reaches a very similar conclusion through an entirely different approach to the problem. It would be really nice to report that more PC-Write users have paid for their copy than Wordstar users, but there are no solid figures.

To try PC-Write in this country, your best bet is to invest £15 in membership of the IBM PC User Group (nothing to do with IBM, I assure you), which keeps it as part of their mighty software library all of which is available to members. They now have over 130 disks full of software available at a nominal £5 plus VAT each. The programs are roughly split two-thirds to one third in favour of utility software over applications software, and they are all either public domain or shareware products. The PC User Group's 3500 members are encouraged to offer their own software to the library, so it could be a good way for a keen young programmer to make a name. They aren't snobbish about you having a genuine IBM – owners of compatibles are welcomed too.

PRIME TARGETS

User groups and clubs are prime targets for the seeker of cheap or free software in this country. A selection of contacts for the major groups is given below: if you want a more comprehensive list, try at the local reference library for *The Microcomputer User's Yearbook 1985,* published by VNU Business Publications. Write in enclosing a stamped addressed envelope for details – don't telephone unless you absolutely have to as most of these organisations are hard pressed.

As a rule, public domain software trackers will find that utility programs are more easily found than applications programs. There is an enormous amount of variety in the functions filled by different software libraries from different user groups or bulletin boards. This is because people tend to write programs for their own use, and only then think about making their work available to others.

The success of PC-Write and other examples proves that if your programming is good enough, and you have a genuinely useful software idea, a living can be made from marketing goods on the shareware principle. The potential profits might not be so big, but the costs are pretty negligible too.

Sources

Amateur Computer Club
Church Lane
Stratton St Michael
Norwich NR15 2QB

British Apple Systems User Group
PO Box 174
Watford,
Herts WD2 6NF

CP/M User Group
72 Mill Road
Hawley
Dartford
Kent DA2 7RZ

Independent Commodore Products User Group
30 Branchester Road
Newbury Park
Ilford
Essex IG2 7EP

IBM PC User Group
PO Box 593
London SW1 2PG

MSX Users Club
PO Box 450
Brighton BN1 8GR

Quanta (Independent QL User Group)
24 Oxford Street
Stony Stratford
Milton Keynes MK11 1JU

Workman and Associates
112 Marion Avenue
Pasadena, CA 91106
United States of America

BASIC SOUNDS NO EXTRAS

Richard Sargent explains the musical capabilities of five popular computers, in Basic, and without recourse to expensive MIDI extras.

There is no doubt that computers are poised to make deep inroads into the professional music business both in the making of recordings and also in live performances.

The MIDI (Musical Instrument Digital Interface) equipment (see *Computing Age* issues two and three) already connects mediumly-expensive brands of micro to similarly priced electronic organs, synthesisers and drum kits.

The price of MIDI will undoubtedly fall in 1986: alternatively if you have real money to burn you can today buy a sufficiently powerful synthesiser to emulate a small orchestra.

However, although the computer music scene holds much promise it's rather more sensible to take a look at what the built-in state of the art is at the moment. What, in other words, can your micro give you in the way of sound facilities which don't involve you in extra expense?

Are 16-bit micros more musical than the eight-bit variety? Are some micros blessed with magical musical software? Can you transfer a tune from a Beeb to an Amstrad 6128?

As this survey shows, apart from the common link between a note and its frequency, most micros are as alike as the proverbial chalk and cheese!

MUSICAL GLOSSARY

Sounds are made by oscillators. The more oscillators provided by the computer, the more sounds you can have running simultaneously. These separate sounds are variously referred to as a CHANNEL, VOICE, SOUND, SOURCE or OSCILLATOR.

Having only one oscillator (Spectrum, QL) produces monophonic sound and older readers may recall the battery operated "Stylaphone" much advertised by Rolf Harris. Younger readers may be familiar with "Major Morgan", which sounds similar.

Both are transistorised organs and sound much like the BEEP of the Spectrum or QL. To play chords you need more oscillators, and most computers now have at least three. This enables polyphonic sound to be produced.

The oscillator produces a repeating waveform. The rate of repetition gives the frequency and the change in volume of the note as it sounds is known as the envelope.

The shape of the single cycle produced by the oscillator is usually a simple rise-and-fall shape.

Computers run on squarewaves: it's their heartbeat of between two and eight MHz frequency, and division of this master clock often provides the raw material for the sound-generator chips which are also inside the computer. Extra circuitry is needed to produce the other waveforms.

The Commodore 64 has the circuitry, encapsulated in its "SID" ULA (uncommited logic array) and can supply, on command, square, sawtooth or triangular waves. Notes of the same frequency don't sound the same when different waveforms are being used to generate the frequency: this is one of the reasons why musical instruments sound different, and so the Commodore 64 is one step ahead with its ability to sound three separate waveforms.

However, if you've only got a squarewave oscillator don't despair – putting its output into a hi-fi amplifier with separate treble and bass controls can filter the squarewave pulses and so reduce the harsh synthetic sound.

Frequency is the number of times a waveform repeats itself every second. It's measured in cycles-per-second, otherwise known as Hertz, or simply Hz. With most oscillators it should be possible to produce frequencies in the human sound-range of 20Hz-20,000Hz.

Some micros expect to be told exactly what frequency to produce, some require a pitch number, some a period number, some a note number and still others a note letter. Pitch numbers allow small but musical increments of frequency change.

The period number, on the other hand, is the number of ticks of the master oscillator-clock used to give a pulse of the required frequency, a low pitch number gives a high frequency. The note number is usually a number in the range 1-72 covering all possible notes of a six-octave keyboard.

A note letter is C,D,E,F,G,A,B (and the relevant sharps), and it must be accompanied by an octave number if it is to make any sense. How a machine's Basic handles its sound chip is another matter and often a subject of great debate between users of rival machines. The POKEs required on the Commodore are acknowledged to be a monumental disgrace, and although the note number/octave number syntax of the Dragon, Oric and Atari 520ST machines is simple, most musicians prefer the pitch or period number system since this allows fine tuning and glissando (musical pitch-sliding) effects.

The Amstrad has the period system, the BBC micro has pitch numbers set to quarter-semitone increments.

The general Basic listing of **Listing 2** prints the conversion table for the notes and their frequencies.

ENVELOPES

Natural sounds do not have a level of volume which is constant over time. Percussion sounds, for example, build up to full volume quite quickly (the attack phase) and then take a while to die away gradually (the decay phase).

Stringed instruments are more complicated still, since immediately after the full volume has been reached the decay phase is only partly achieved and a sustain period takes over, in which the volume is reasonably level. Some time later a rapid release occurs and the sound fades to nothing.

The full four phases give us the ADSR Envelope, which is typified by the piano sound shown in **Figure 1.**

The ability to manipulate the ADSR time periods, which is the forte of the Commodore, the Amstrad and the BBC micros, helps to achieve sounds which are closer to real instruments, even when the envelope is applied to the rather unnatural square waves.

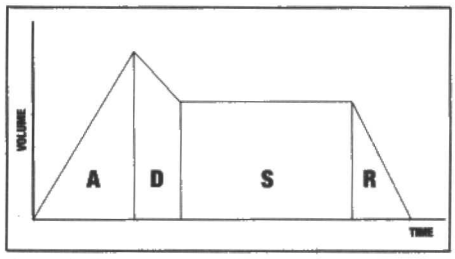
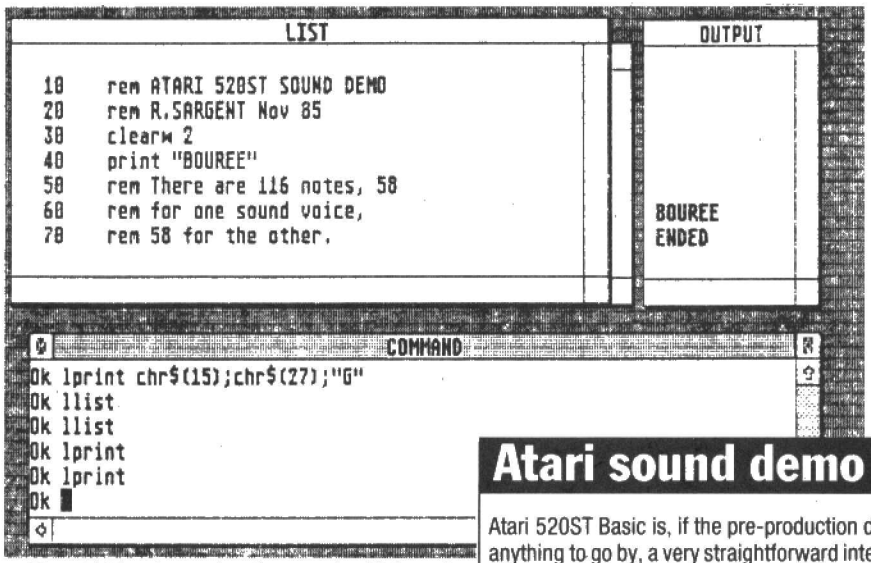


Figure 1. Typical ADSR envelope.



The BBC micro, the Amstrads 464 and 6128, the Commodore 64, Enterprise and the Atari 520ST are all three-channel micros which, for various reasons, are likely to be the ones on which music is most commonly heard. The monophonic Dragon, Spectrum and QL may well make the occasional BEEP but there can't be many of them in the field being used for musical applications.

For each micro three questions should be asked. What are its technical sound facilities? How easily can these facilities be manipulated from Basic? What is the quality of professionally written software available for it? Here, in detail, is how the quintet shapes up. Earmuffs at the ready!

THE BBC MICRO

It was the BBC micro, not the Commodore 64, which brought synthesiser-style music to the humble home micro. It hasn't got all the facilities of the '64, but at least sound is well explained in the manual (with diagrams to explain ADSR and a table to show the relationship between musical notes and the pitch number) and even a beginner can persuade the Basic to play some pleasant sounds.

The internal loudspeaker is small and there is no volume control fitted, although as with all the five micros with the exception of the QL, volume can be controlled by software. However, the convenience of a mechanical volume control is indisputable and its absence is soon very noticeable.

Music is usually played with reference to a look-up table – only the Atari 520ST allows you to specify the note and octave directly. Since computers are efficient at handling their own lookup tables, this really isn't a problem, but for simple sounds the values can be looked up in the pages of the BBC manual.

To play an E5 crotchet (frequency 2637Hz) requires this line: SOUND 1,–15, 165,10. ie. channel 1, full volume (a positive number here would select an envelope), pitch number 165, duration 10 twentieths-of-a-second. The next note up the scale,

Atari sound demo

Atari 520ST Basic is, if the pre-production disk is anything to go by, a very straightforward interpretation of the standard Microsoft Basic and is as such entirely unremarkable.

However, if you have a 520ST and don't have a yen to program in 68000 code or DR LOGO, then Atari Basic is all you have to play with – at least until a better version comes along.

GEM's desktop gives a good illustration of the machine's graphics capabilities and with Basic loaded, the 520's sound chip can be tried out. The 520ST, which uses the same sound chip as the Amstrad computers, has two sound commands called SOUND and WAVE which form the frequency and the shape of the waveform. Three channels can be sounded, although on my version of Basic, only channel one seemed to be operational.

For dedicated sound-users, the bad news is that there appears to be no provision for envelope shaping or sound-synchronisation. The WAVE command merely allows the setting of various sound-chip registers and is no substitute for the ADSR (attack-decay-sustain-release) facilities offered by Amstrad, the BBC Micro and the Commodore 64.

The SOUND command takes the form SOUND <channel 1-3>, <volume 0-15>, <note 1-12>, <octave 1-8>, <duration>. Duration is given in 0.02sec increments. Unlike the commands of some other micros, quarter semi-tone or half semi-tone changes in frequency are not possible, which is a pity because it is these slight frequency shifts set between one sound channel and another which enhance the otherwise perfect tone of the sound chip.

If you have access to the pitch data for BBC Micro music, you can convert it for use with the 520ST by dividing by four and then using the subroutine at line 1000 thus:

```
2000  INPUT bbcpitch
2002  y=INT(bbcpitch/4)
2004  GOSUB 1000:GOTO 2000
```

Two numbers are printed for each BBC pitch value entered, z, the Atari octave number and w, the Atari note number.

In all other respects the program listing is self-explanatory: the data statements simply contain the octave and note-number data for the music. With any luck, Atari Basic has now got all three sound channels working and the REMs of lines 170 and 180 can be removed.

LISTING 1. ATARI SOUND DEMO.

```
10   rem ATARI 520ST SOUND DEMO
20   rem R.SARGENT Nov 85
30   clearw 2
40   print " BOUREE"
73   dur=5
74   for q=1 to 2
75   restore 210
76   vol=15
80   for x=1 to 58
90   read n1,o1,n2,o2
160  sound 1,15,n1,o1,dur
170  rem sound 2,15,n2,o2,dur
180  rem sound 3,vol,n2,o2-1,dur
190  next x
195  next q
196  sound 1,15,n1,o1,50
197  sound 1,0,0,0,1
198  sound 2,0,0,0,1
199  sound 3,0,0,0,1
200  print " ENDED":end
210  data 6,5,9,3,8,5,8,3,9,5
220  data 6,3,9,5,6,3,8,5,11,3
230  data 6,5,11,3,5,5,1,4,5,5
240  data 1,4,6,5,11,3,8,5,11,3
250  data 1,5,9,3,1,5,9,3,3,5
260  data 8,3,5,5,8,3,6,5,6,3
270  data 6,5.6,3,4,5,8,3,2,5
280  data 8,3,1,5,9,3,1,5,9,3
290  data 11,4,11,3,9,4,11,3,8,4
300  data 1,4,8,4,1,4,9,4,11,3
310  data 11,4,11,3,1,5,9,3,11,4
320  data 9,3,9,4,1,4,8,4,1,4
330  data 6,4,6,3,6,4,8,3,6,5
340  data 9,3,8,5,8,3,9,5,6,3
350  data 9,5,6,3,8,5,11,3,6,5
360  data 11,3,5,5,1,4,5,5,1,4
370  data 6,5,11,3,8,5,11,3,1,5
380  data 9,3,1,5,9,3,3,5,8,3
390  data 5,5,8,3,6,5,6,3,6,5
400  data 6,3,4,5,8,3,2,5,8,3
410  data 1,5,9,3,1,5,9,3,11,4
420  data 2,4,9,4,2,4,8,4,4,4
430  data 8,4,4,4,9,4,4,4,9,4
440  data 4,4
1000 let z=(int(y/12))+1
1010 if z=1 then w=y+1:goto 1030
1020 let w=(y-((z-1)*12))+1
1030 lprint w;" ";z
1040 return
```

'Musically speaking, the current 16-bit machines are a great disappointment'

F5, has a pitch number of 169. Values 166, 167 and 168 are the three quarter-semitones between E5 and F5.

An important feature, copied by the Amstrad and Enterprise micros, is the ability to synchronise two or three notes so that they sound simultaneously. This is done by expanding the channel number into a four digit hexadecimal number:

```
200  SOUND &0201,-15,53,40
210  SOUND &0202,-15,69,40
220  SOUND &0203,-15,81,40
```

Each of the four digits following the & has special significance. The first is zero, indicating that new notes have precedence over old – in other words the old note is cut short by the new note. The second digit, a 2, indicates that the sound can only begin when information from two other channels has been received.

The third digit must be zero since a one will wipe out all notes currently sounding (which is useful in some contexts). The fourth number is the actual sound channel.

If the sound is to be modified by an envelope, one must first be created. This is done by the ENVELOPE command, which has 14 parameters, shaping volume by a four section ADSR and pitch by a three section envelope. Having created ENVELOPE 1, it can be "switched on" by replacing the negative amplitude parameter by the number 1 in any sound statement in the program, provided the ENVELOPE command precedes the SOUND statement.

With 14 parameters in each of four possible envelopes, it is perhaps easy to understand why the best music software comes from the professional software houses. However, the manual explains SOUND and ENVELOPES adequately, and provides a table of pitch-note relationship, though you will search in vain for pitch/note to frequency information.

Commercial software and add-on keyboards are available for the BBC computer, notably Island Logic's "The Music System" (£25) and ATPL's "Symphony" software/keyboard combination (£125).

AMSTRAD CPC464/6128

The Amstrad has a marginally better sound specification than the BBC micro though it's really a case of more of the same, and the final effect doesn't appear to be noticeably different from the Beeb. A volume control is provided and a stereo output to a hi-fi is also fitted.

Stereo is not under software control, but is merely provided by a resistor divider network which diverts channel one to LEFT, channel three to RIGHT and channel two at half-volume to left and right. The internal speaker gives mono. Playing the C-major chord on the Amstrad can be achieved by the lines:

```
200  SOUND &X00110001,956,200,15
210  SOUND &X00101010,758,200,15
220  SOUND &X00011100,638,200,15
```

which should sound the same as it did on the Beeb. Working backwards through this command, the 15 is the volume, 200 is the duration in one-hundredths of a second, 956 is a period number corresponding to the note C2, and the awkward number is a bit-significant number holding channel and synchronisation information. Different format, same effect.

An envelope is engaged by first defining it – now there are two envelope commands, one for volume envelopes (ENV) and one for tone envelopes (ENT) and each can have up to 16 parameters. Furthermore, 15 ENVs and 15 ENTs can be created: just as well the Amstrads have more RAM than the Beeb!

The reason for the extra parameters is that the ADSR can have a fifth section (I wonder what it's called?) and the tone envelope can have five sections. ENV 1 and/or ENT 1 having been written, they are tagged onto the end of the SOUND statement thus:

```
SOUND 1,956,200,15,1,1
```

Lest you think it all too easy (after all, how long does it take to work out 32 envelope parameters on a dark winter's evening?) there is a snag from which the Amstrad suffers and which the Beeb doesn't.

Amstrad period values are inversely proportional to the frequency, but do not change uniformly like the BBC pitch values. Thus note F7 has a period value of 22 and E7 has 24 (a difference of two but F0 has 2863 and E0 has 3034 (a difference of 171). These hundred or so incremental steps between one semitone and the next are excellent for pitch blending, vibrato and glissando and it's a pity the increments get fewer in the high octave ranges.

It is perfectly possible for the computer to convert BBC pitch values to Amstrad period values, enabling a data bank of pitch and duration values borrowed from a BBC listing to be typed into the Amstrad with every chance that it will sound the same. The conversion formula is shown in **Listing 3,** which will run (on an Amstrad) as is.

If you want to incorporate the formula in your own sound program, put the three lines 110-130 near the start of your listing and the three-line subroutine 9000-9020 near the end. Pass each pitch value to the subroutine and receive back a period value. Converting duration needs no subroutine – the Amstrad duration is simply the BBC duration multiplied by five.

The Amstrad manual is a mine of information on SOUND, ENVELOPE and period/frequency/note relationships: as ever you just need some patience to program the ENV and ENT commands.

Music maestros will be delighted to learn that Island Logic are busy transferring "The Music System" to the Amstrads and doubtless some form of additional keyboard and MIDI interface will follow.

LISTING 2

```
100 REM NOTE TO FREQUENCY CONVERSION
110 DIM F(132):V=16.352:W=1
120 FOR N=1 TO 132
130 F(N)=V:V=V*1.05946286:NEXT N
140 D$="----------------":PRINT D$
150 O=-1:GOSUB 180
160 FOR O=0 TO 9
170 GOSUB 180:NEXT O
180 RESTORE 290
190 FOR N=1 TO 12
200 C$=RIGHT$(STR$(O),1)
202 C$=RIGHT$(STR$(O),1)
210 READ A$:PRINT A$;
220 IF W>12 THEN PRINT C$;
230 PRINT TAB(5)N;
240 FREQ=(INT(F(W)*100))/100
250 PRINT TAB(9)FREQ:W=W+1
260 IF W=122 THEN PRINT D$:PRINT:STOP
270 NEXT N
280 PRINT D$:RETURN
290 DATAC,C£,D,D£,E,F,F£,G,G£,A,A£,B
```

LISTING 3

```
100 REM BBC PITCH TO AMSTRAD PERIOD
110 DIM F(64):V=246.942:W=1
120 FOR N=1 TO 64
130 F(N)=V:V=V*1.05946286:NEXT N
140 :
150 INPUT "BBC PITCH NUMBER ";P
160 GOSUB 9000
170 PRINT "PERIOD NUMBER IS ";P
180 GOTO 150
190 :
9000 IF P=1 GOTO 220
9010 P=(INT(P/4))+1
9020 P=ROUND(125000/F(P)):RETURN
```

LISTING 4

```
10  REMark QL musical scales
20  RESTORE 60
30  FOR X=1 TO 13
40  READ p: BEEP 0,p,p+1,2,1,14:
    PAUSE 20:END FOR x
50  BEEP:REMark turn off final note
60  DATA 78,73,69,65,61,58,53,50,46,
    43,40,37,35
```

COMMODORE 64

The Commodore 64 used a custom-made sound chip containing 29 control registers. Initial suspicions that it is therefore twice as powerful as the 11 register AY-3-8912 (Amstrad, Atari 520ST,MSX) and the eight register SN76489 (Beeb, MTX) are probably correct.

The tragedy is that Commodore Basic will not communicate with the chip, though Simon's Basic does have five sound commands. To play "Michael row the boat ashore" the Commodore 64 manual uses 11 POKES, a FOR-NEXT delay loop to set the note duration, and 15 lines of Basic.

Most information on sound is tucked away in the appendices and is both brief and technical. Thus users will probably never discover that oscillator 3 and envelope generator 3 can be used with the filter to change the waveform and pitch of another note.

Neither will they appreciate the 65536 steps between 1Hz and 3900Hz which allows synthesiser glide effects. So does simultaneous synchronised sound (ie. chords) exist on the '64? Yes, certainly, but by using POKES; you'll have to buy some synthesiser software before you can even begin to appreciate the quality of sound on this micro. Better things are expected of the Amiga . . .

On the commercial software front, there is a wealth of music programs and keyboards for the '64, many of them designed and/or promoted by Commodore. Prices are on the whole low: there are two clip-on keyboards (Music Maker and Siel CMM25) and a MIDI-using software package "Sound Studio", all under £20. Island's TMS also has a MIDI option, and there is a colourful package from the game-masters Activision called "Music Studio".

Slightly more expensive add-ons in the £100 range giving automatic rhythm and bass accompaniment are expected to be available this Christmas, giving sound production approaching that of the Yamaha DX FM synthesiser series.

THE QL

The QL, conceived as a cheap business machine, has no sound chip as such (sound is one of the tasks of the second processor, the 8094) but it can beep its way to passable tunes, and now, by virtue of drastic price cutting and consequent increased sales, its sound facility may come under closer scrutiny by software writers.

To be fair, the QL Beep is rather more versatile than that of the Spectrum, but it is inadequately explained in the manual: there are two pages of explanation, no examples and I couldn't find a pitch to musical note conversion table anywhere. Six additional parameters can follow the DURATION and PITCH values. They are:

PA: an alternate pitch level to which P will ramp (ie. rise and fall).

GX: the time interval between P and PA (X axis of the ramp).

GY: the number of steps between P and PA (Y axis of the ramp).

W: Wrap. ie. number of ramps for every specified P-PA pair.

F: Fuzziness. Effectively the addition of noise to the tone.

R: Effectively the "randomness" of the additional noise.

By using PA, GX, GY and to a lesser extent W, different sounds can be created, with, for example, a passing resemblance to an organ or a "Wah-Wah" synthesiser sound. PA, GX and GY are the QL's attempt at providing envelope pitch control. There is no volume control and no amplitude envelope.

There would be little point in superimposing much fuzz or random element onto the tones, which produce a harsh enough sound to begin with – in technical terms F and R act on the ramp but the end effect produces noise and their use is probably best reserved for explosions and the like. Experiment says the manual, and experiment you must.

Listing 4 plays the musical scale from C to C. Note that DURATION must be set to zero (signifying endless play) and a PAUSE put into the playing loop. This is because duration only works for isolated notes – in any musical sequence each subsequent note overrides the one sounding, regardless of the value entered for duration.

As can be seen in line 60, the interval between the semitones falls steadily in much the same manner as the period values on the Amstrad. Like all the other micros in this survey, the QL can make a sound and compute at the same time, which is something its baby brother Spectrum can't do in Basic.

ATARI 520ST

The Atari 520ST has some very large ULAs inside it but a sound chip isn't one of them. Instead, the General Instrument's AY-3-8910 has been pressed into service, with a perfunctory handling of its registers by two Basic commands SOUND and WAVE.

The machine should, in theory, sound every quaver as good as the Beeb or the Amstrad, but it doesn't – yet. Notes are entered by their position on the scale as NOTE number 1-12 and OCTAVE number 1-8. International A is note 10 in octave 4. The channels are called voices, and duration is measured in fiftieths-of-seconds, but otherwise the SOUND command is straightforward.

Note synchronisation, otherwise known as sound queueing, is not implemented, and on my pre-production disk, channels one and two didn't seem to work. The WAVE command simply lets the user write to part of the sound chip: the AY-chip has a simple hardware implementation of amplitude envelopes which can be set by sending various numbers directly to the chip registers, but this is in no way comparable to the complicated software-controlled ENVELOPES running under interrupt control which are a feature of the other micros (with the exception of the QL).

However, Atari has "Music Composer" software running on their other machines, some of which is on ROM cartridge, and there is every reason to suppose that one will become available for the 520, complete with a sheet-music display on the GEM windows. Until then, 520 owners will have a frustrating time. The MIDI interface is also on the machine, but there is as yet no software to run that either.

CONCLUSION

If you want a computer which can, at some little extra cost, be a fully fledged synthesiser, then the aged Commodore 64 would seem to be the best bet. The music peripherals for the '64 may also fit (and run) on the Commodore 128 switched to its 64-mode, but you would be advised to check with the peripheral manufacturers first to make sure.

The cheap and cheerful Amstrad will provide you with music if you care to write it yourself in Basic – there's certainly enough memory onboard and on disk to hold volumes of tunes. However, I wouldn't necessarily wait for any music software to come along: knowing Amstrad they'll have a new computer-cum-synthesiser on the shelves by next Christmas.

The current 16-bit machines are a great disappointment, musically speaking, but that could well be a marketing problem.

Specifications

BBC micro

OSCILLATORS	3 square wave
NOISE GENERATION	8 types
FREQUENCY RANGE	5 octaves
ENVELOPE SHAPING	4 ADSRs volume & pitch
FILTERING FACILITY	none
OUTPUT	internal speaker
BASIC SYNTAX	SOUND C,A,P,D
MIDI	Peripheral available

Amstrad CPC464/6128

OSCILLATORS	3 square wave
NOISE GENERATION	1
FREQUENCY RANGE	8 octaves
ENVELOPE SHAPING	15 pitch & 15 volume ADSRs
FILTERING FACILITY	none
OUTPUT	internal speaker, stereo skt.
BASIC SYNTAX	SOUND C,P,D,V
MIDI	none

Commodore 64

OSCILLATORS	3 with selectable waveform
NOISE GENERATION	3
FREQUENCY RANGE	8 octaves
ENVELOPE SHAPING	3 ADSRs volume & pitch
FILTERING FACILITY	Variable treble cut
OUTPUT	via TV also DIN skt
BASIC SYNTAX	none!!
MIDI	Peripherals available
MODULATION	from oscillator three

QL

OSCILLATORS	1 square wave
NOISE GENERATION	partial
FREQUENCY RANGE	20 octaves
ENVELOPE SHAPING	none
FILTERING FACILITY	none
OUTPUT	internal speaker
BASIC SYNTAX	BEEP P,D
MIDI	none

Atari 520ST

OSCILLATORS	3 square wave
NOISE GENERATION	1
FREQUENCY RANGE	8 octaves
ENVELOPE SHAPING	minimal, not ADSR
FILTERING FACILITY	none
OUTPUT	via TV
BASIC SYNTAX	SOUND C,V,N,O,D
MIDI	yes

SP-EDIT

Gary Evans looks at a new wordprocessor for the Dragon, and finds it writes, spells – and communicates.

The most obvious choice of wordprocessor for owners of the Dragon computer, who have invested in either the Flex or OS9 operating systems, is Stylograph. Now those using Flex have an interesting alternative in the form of SP-EDIT, a new word processing editor and spelling checker developed by Compusense.

Some may question why Compusense has invested the time and resources necessary to produce SP-EDIT when a number of WPs running under Flex have been available for some years, including Stylograph. The answer is that SP-EDIT was developed to overcome the shortcomings of many of the existing packages and Compusense has also taken the opportunity to integrate a comms package into SP-EDIT for those making use of electronic mail – more on this later.

Assuming that SP-EDIT is correctly configured for the user's system (in most cases this will be Compusense FLEX), the word processor may be called in one of two ways – either by simply typing the command SPE, or SPE followed by the name of a document to be edited. On first entering the editor it will be in command mode and the screen will display a menu of options open to the user.

'A major feature is that it is designed for use with a variety of e-mail systems'

Those familiar with Stylograph will recognise that the way in which SP-EDIT functions in use owes much to the general structuring of Stylo.

On entering edit mode the menu is replaced with a text screen. If the editor was called without naming a file, this screen will be largely blank. The first line consists of a page separator naming the page and line number corresponding to the current cursor location and also indicating whether or not the display has been scrolled horizontally. The text screen also displays a second line that indicates the end of the document.

To enter text the system must be put into the Insert mode, by hitting the semi-colon key. While in the Insert mode, text entered at the keyboard is displayed on screen, and lines of text are automatically formatted to the default line length which is set to the width of the display screen. The instruction manual that accompanies the software makes the usual suggestion that users should not concern themselves with the presentation of text as it is entered – this leads nicely onto a description of the format and cursor movement commands.

A common problem that the authors of WP software have is that most micro computers have a limited number of facilities. This means that nominated keys from the standard QWERTY set are allocated specific functions associated with cursor control. The cursor may be moved left and right by single character spaces or up and down by complete lines. Other functions include page up/down and a home key.

The commands associated with text formatting are entered at the start of a text line on which the first character is a comma, ie ,PL nn whould set the page length to nn lines (default is 66 lines per page).

BLOCK MOVES

An important feature of a word processor is the ability to cut and paste, that is to insert and delete blocks of text at any point in a document. SP-EDIT supports a number of commands associated with insertion/deletion of sections of text. The I and M commands, selected from the main menu, allow marked sections of text to be loaded from/saved to disk. In addition blocks of text may be duplicated from within the edit/insert mode. For example, to duplicate a section of a document the user first marks the end of the text to be duplicated. The cursor is then moved to the start of the section. Selecting the S (save) function will then put the text into an internal buffer. The cursor can then be repositioned at any point in the document and the contents of the buffer entered at that point by pressing the D (duplicate) key.

FREE SPELLING

Many people will regard the provision of a spelling checker as one of the most important features of a word processor. With many WP packages, users are expected to pay extra for a spell check facility, but SP-EDIT comes complete with a comprehensive spell check feature as part of the basic price. The standard dictionary supplied with the checker consists of some 10,000 words although users may add to this on a temporary or permanent basis using utilities supplied with the WP software.

Another useful SP-EDIT feature is the browse command. This is a Flex command and allows users to examine text files on disk. Note that as this is a Flex command it runs entirely in the utility command area. Browse will not only allow documents to be listed to the screen but will also allow the

'SP-EDIT comes complete with a 10,000-word spell check feature'

file to be searched for a specific text string.

The documentation supplied with SP-EDIT is a comprehensive, easy to digest guide to the use of the software. The manual includes a tutorial section that should allow even novice users to get the system up and running within a short space of time. All the commands are introduced in a clear and logical fashion and the manual concludes with a series of appendices that provide a handy quick guide to the control keys in addition to a series of listings giving details of SP-EDIT configuration constants and details of the printer control code sequences necessary to drive an Epson type printer.

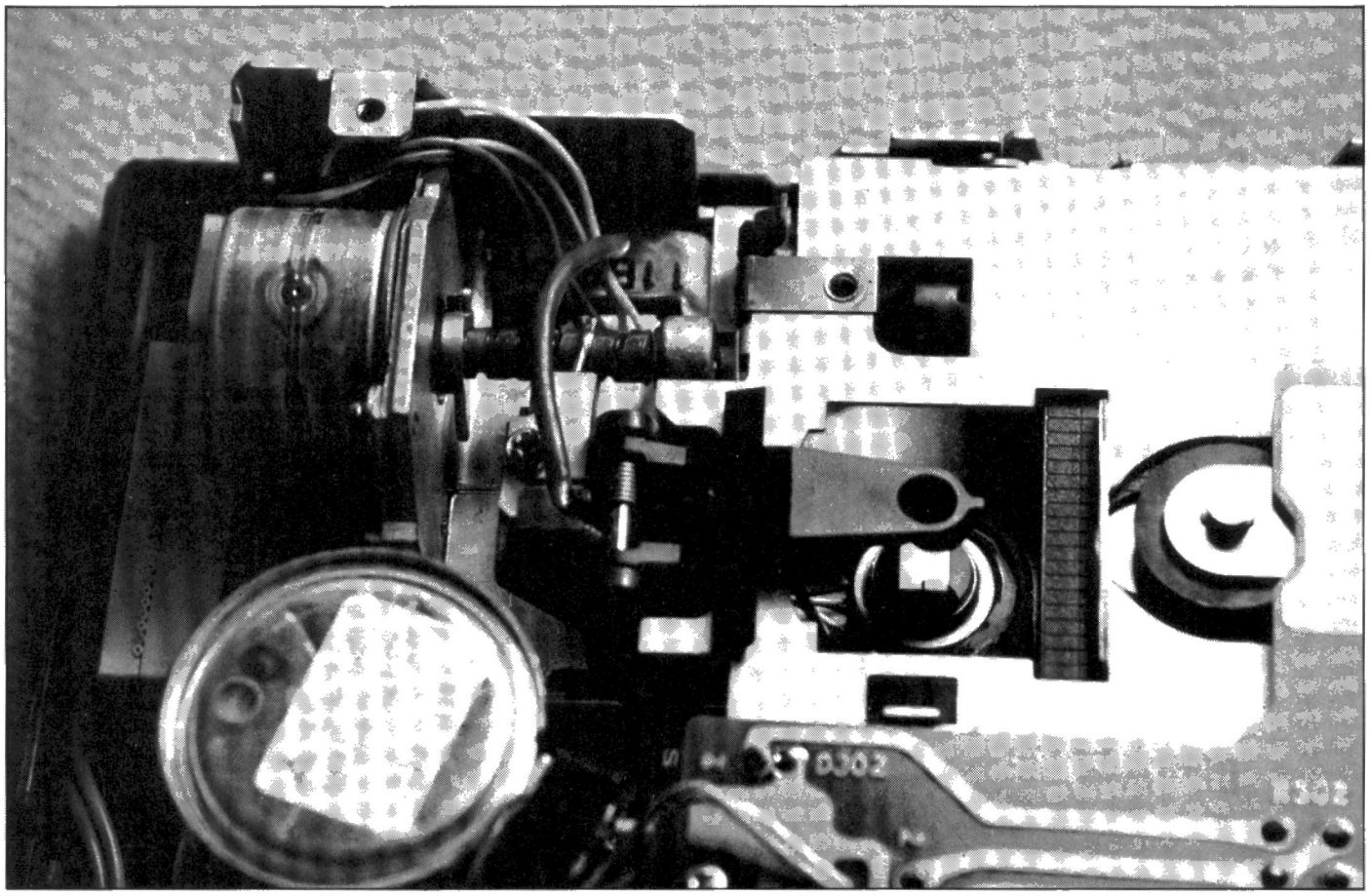
SP-EDIT is a full feature text editor that, when used with an appropriate printer, can be used to produce documents featuring a range of formats and text fonts. While the facilities offered are comprehensive, the system has been designed to be easy to use. As a stand alone word processor, SP-EDIT offers all those facilities expected in a micro based system. There is more to SP-EDIT than this though. A major feature of the system is that it is designed for use with e-mail systems such as Telecom Gold and One-to-One. The software means that the Dragon computer, together with a suitable modem, can be used to dial into a variety of communications networks operating to different protocols. SP-EDIT allows users to prepare documents off-line for subsequent transmission to an e-mail box and to spool incoming text to a disk file that can then be edited and formatted to suit the user's requirements. Few word processors have this capability built in and in view of the fact that the use of e-mail services is becoming an increasingly important application of micro computers, the comms facility gives SP-EDIT a distinct advantage.

SP-EDIT

Machine: Dragon running Flex OS
Supplier: Compusense, PO Box 169, 286D Green Lanes, LONDON N13 5XA
Telephone: 01 882 0681
Price: £75.00

COMPATIBILITY IN CHAOS

The mechanism of the Amstrad (Hitachi) 3" drive.



Micro floppies are rapidly superceding the 5.25" drive, but the different formats may wreck attempts to create a new standard. Mike James puts a difficult situation into perspective.

Micro floppy disks, that is 3" and 3.5" disks, are rapidly becoming the new standard for data storage in both low and high cost personal computers. This is very good from the point of view of performance – micro disks store as much data as the highest capacity 5.25" floppy and are much tougher – but currently very bad from the point of view of standards and compatibility. Apart from the obvious incompatibility between 3" and 3.5" disk drives there is a less obvious and less well known incompatibility between different types of 3.5" drive. As manufacturers begin to give sighs of relief that the sub 5.25" disk drive standard has been agreed, users are left to cope with the real and rather confusing situation.

There are many problems associated with the 5.25" floppy disk and drives. The most obvious is that they are on the large side, if not to the extent of the monster 8" disks and drives thjat they replaced. Drive manufacturers have worked wonders in packing all the electronics and electromechanical components first into half height drives and now, from Epson, into the one third standard height drive. But there is no avoiding the fact that the actual disk is 5.25" square.

A few years ago it became clear that the time was right to introduce a floppy disk and drive using essentially the same technology as the 5.25" disk but smaller. It was realised that you could reliably store about the same amount of data on a disk of around the 3" mark. The reason for this apparent 'quart in a pint pot' situation is that a smaller disk distorts less, so the read/write head can be positioned more accurately and the design of the disk and its case was improved to give greater accuracy and reliability. In other words, given all that has been learned about 5.25" disks, manufacturers could do better by starting again than by trying to improve the old standard.

TOUGHER FORMAT

From the user's point of view the most important feature of the proposed smaller diskettes is their robustness. Every personal computer user knows that floppy disks are delicate and must be protected from dust, heat and magnetic fields. More to the point, floppy disks are not good travellers. To prove this there is of course the apocryphal story of the envelope con-

taining a disk that came through a letter box folded in half and, just below the "Floppy disks do not bend" message was written "Oh yes they do!"

To meet the demand for smaller disks, manufacturers, having no standards to follow, started to produce disks and drives in a wide range of shapes and formats. There were various 3", 3.25" and 3.5" models and just because two manufacturers used the same size diskette didn't guarantee that they were producing compatible products. In the early days things were very confused and it was a brave computer designer who picked a winner from the pack to include in their latest personal computer. But many did choose and slowly a number of favourites emerged. After even more natural selection the situation seems to have simplified to the point where there is a single clear winner for the diskette standard – the Sony 3.5" (sorry Amstrad users!) – and two types of drive that will use it, the Sony standard and the 5.25" compatible standard. However, this said there are a great many current users of Hitachi's 3" system, especially in Japan, but most manufacturers wouldn't use it unless there was a need to maintain compatibility with existing products.

THE HITACHI 3" DISK

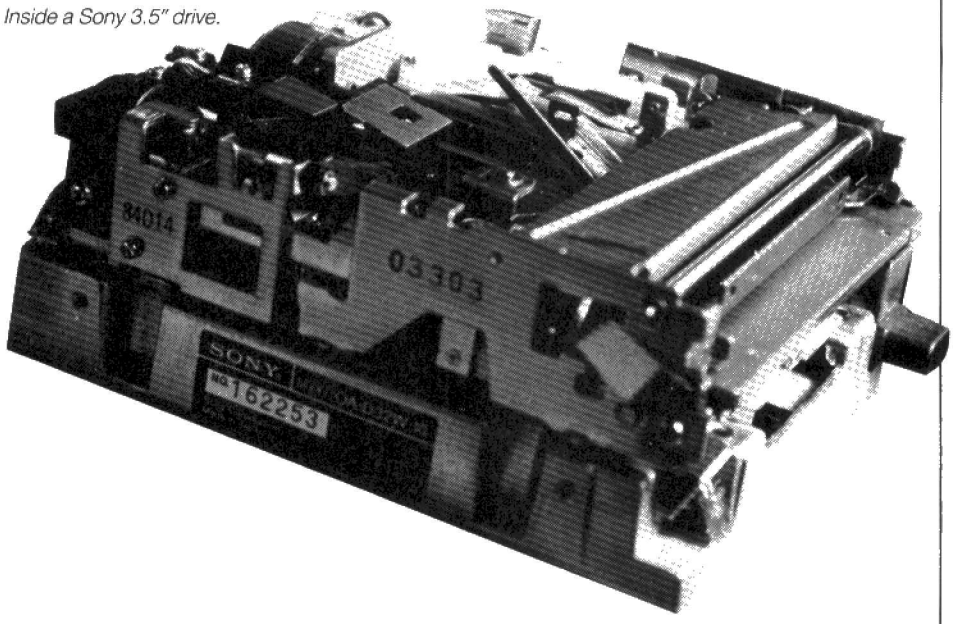
The only major computer manufacturer in the UK currently using the Hitachi 3" disk is Amstrad but this is sufficient to keep it alive for some time yet. The 3" standard is very popular in Japan because the postal authorities will accept a 3"disk but no bigger for the same price as a letter. The 3" disk is a little narrower but surprisingly a little longer than its 3.5" rival. It is packaged in a stiff plastic jacket and the read/write slot and index hole are protected by a metal shutter. When the disk is inserted in the drive the shutter is withdrawn by a simple slide mechanism allowing the read/write head to access the surface of the disk.

In use 3" disks are a great improvement over 5.25" disks. They are more robust and reliable but do not store as much data as the highest capacity 5.25" disks. A standard 3" disk drive works at 100 tpi (tracks per inch) with a maximum of 40 tracks per disk, single or double sided. Using single density recording methods this gives 125K per side unformatted which comes down to around 80K per side after formatting. Of course double density recording brings this up to 250K per side unformatted but this is still not as much as the 500K per side that is expected from an up-to-date 5.25" drive.

The main advantage of the 3" drive is that it represents a single standard and it is compatible with 5.25" disk controllers. That is, if you have a machine that uses 5.25" drives you can replace them with a 3" drive with no more trouble than changing the connector on the ribbon cable. After this the 3" drive can be treated like an equivalent 40 track 5.25" drive and no changes to the software should be necessary. A number of suppliers offer 3" drives for machines that were originally intended to use 5.25" drives (the BBC Micro for instance). It is also worth noticing that the reverse is true and that it is possible to replace a 3" drive with a 5.25" drive. For example it is relatively easy to add a 5.25" drive to your Amstrad 664.

The 3" drive has an uncertain future and it is difficult to find anyone other than Amstrad owners prepared to be positive about it. It is rumoured that a number of drive manufacturers are planning to stop making 3" models but this is more a reflection of the 3.5" drive's success than the failure of the 3" format. There are certainly a lot of people who wish it would go away, thus simplifying the market, but I don't think they will get their wish so long as Amstrad are selling computers. In short, my advice is that unless you are using an Amstrad don't add 3" drives to your system.

Inside a Sony 3.5" drive.



'There are two types of 3.5" drive, the Sony standard and the 5.25" compatible standard. Sony drives run and retrieve data at twice the speed'

THE SONY 3.5" DISK

At the last count Apple, Apricot, Hewlett-Packard, and a host of portable manufacturers are using 3.5" disks and even IBM is rumoured to have ordered a vast number of 3.5" drives, presumably for a revamped PC later in the year. If this isn't enough proof that the 3.5" disk is standard it has forced Sinclair to waver in its previously staunch support of the QL's Microdrives.

Add-on systems

There are a number of manufacturers selling drives both cased and uncased that are easy to add to an existing disk system. If your machine doesn't have a 5.25" disk controller, eg. a QL or Spectrum, then you have recourse to a number of complete systems with disk controller and disk drive.

BBC Micro

Almost any cased 3.5" drive will do. For example Micro Peripherals sells a double sided 40/80 track drive for £159. Cumana sells a range of drives starting at single sided 40 track and working their way up to a dual drive incorporating double sided 80 track drives.

QL

Micro Peripherals market a disk interface complete with a single drive with 700K of storage for £258 complete. This, with modifications, is supposed to be the system, that will be sold by Sinclair later in the year.

Spectrum

Opus sells the Discovery 1 3.5" disk unit plus interface for the Spectrum. At £199 it currently costs more than the Spectrum but it does include a joystick interface, parallel printer port and video monitor connection.

Others

As with the BBC Micro almost any cased 3" or 5.25" compatible 3.5" drive should work. In particular the units designed for the BBC will work but beware of the need to supply an additional power supply. The BBC Micro has a power supply that is normally used to power add on disks;other machines generally don't have this facility. If you fancy trying to put raw disk drives in a box of your own making them both Midwich, Technomatic and Tekdata sell 3.5" and 3" drives.

Suppliers

Cumana 0483 503121. Micro Peripherals Ltd 0256 473232. Midwich 0379 4131. Opus 01 701 8668. Technomatic 01 208 1177. Tekdata 0782 813631.

The 3.5" disk is similar to the 3" in that it is made out of rigid material but, even though it holds a larger disk of magnetic material, it is nearly the same size as the 3" disk. It too has a metal shutter protecting the read/write slot but in this case it is a simpler sliding affair.

The great advantage of the 3.5" format is the number of tracks that can be recorded without over-taxing the system. There are two standard track densities in use: 67.5 tpi and 135 tpi. At 67.5 tpi a maximum of 40 tracks per side is available, and at 135 tpi, 80 tracks per side. Drives are available for all combinations of single/double density and single/double sided so this makes 1Mbyte the maximum unformatted storage for a 160 track, double density, double sided drive. This very acceptable performance is well within the capabilities of the format and it is likely that some enterprising manufacturer will find ways of increasing the amount in the not too distant future.

TWO TYPES

Everything is looking good and simple for the 3.5" drive, apart from one problem: there are two different types, the Sony standard and the 5.25" compatible standard. The difference between the two lies in the speed that the disk rotates. The 5.25" compatible drives spin at 300 rpm but the Sony drives spin at twice this speed – 600 rpm. This would be the end of the story but for the fact that the Sony data transfer rate is also twice as fast, 500 Kb/s, as opposed to 250 Kb/s for 5.25" compatible drives. What this means is that the bit density is the same for both drives and in theory at least it should be possible to read diskettes written using a Sony drive on a 5.25" compatible 3.5" drive or vice versa – but don't quote me I haven't tried it!

The main advantage of the Sony standard is that reading data is twice as fast. Sony drives are fitted to the Apricot range and I can confirm that there is a noticeable difference in the time to read files when compared to 5.25" compatible drives. What is important about knowing that the Apricot or any machine uses Sony drives is that you cannot connect an extra drive unless it is another Sony drive, ie. no 5.25" drives or 5.25" compatible 3.5" drives. Another small point worth noting is that Sony single sided drives have only 70, rather than 80 tracks.

The 5.25" compatible 3.5" drives are just that! They can be connected in place of a 5.25" drive by no more than the change of a plug on the end of the ribbon cable. Once again, a number of manufacturers supply 3.5" add-on disks for machines that were originally intended for use with 5.25" drives. However, in this case, unlike the 3" drive, I can recommend 3.5" drives as a likely bet for the future.

Although 3" and 3.5" disks are definitely more robust, this is a feature which could be their downfall – people start to think that they are indestructable and this is far from the truth. At 8000 bpi, compared to 5000 bpi for 5.25" disks, they are even more prone to dust and contamination; their only advantage is that their protection is better. It pays not to mistreat a 3" or 3.5" disk and the user's motto should be 'treat them with respect and they'll look after the data'.

Drive specification

	tpi	max-tracks	rotation rpm	bpi	transfer rate	max-capacity
3" drive	100	40	300	8946	250Kb/s	250K
3.50" Sony	135	80	600	8128	500Kb/s	500K
3.50" compatible	135	80	300	8128	500Kb/s	500K

Notes: Max capacity is per side and all assume double density recording.

Reader Services

BBC EPROM BLOWER

CONSTRUCTOR'S PACK

Computing Age has arranged for a complete kit of parts necessary to build this project to be made available to our readers. By taking advantage of the Constructor's pack offer reader's can buy all the parts needed to construct the project from a single source. In addition, the Constructor's pack is accompanied by a set of detailed notes for constructors including some useful hints on fault finding.

Complete kit £29.98 (including all components plus PCB but excluding software).
Suitable Power Supply Unit £11.64 (provides +5V, +6V, +12V).

60p handling charge must be added to all orders.

Send cheques/postal orders to
EPROM Blower Constructor's Pack, c/o Magenta Electronics,
135 Hunter Street, Burton-on-Trent, STAFFS, DE14 2ST.

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January 1985
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HOW TO ORDER

List the boards required and add 50p post and packing charge to the total cost of the boards. Send your order with a cheque or postal order to:

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Staffs DE14 2ST

Please supply the following PCBs:

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BASIC EVENTS

Joe Pritchard examines Events on the BBC micro, the 'potted interrupts' which can cause control to pass around a Basic program.

I have a peculiar habit; I like messing around with the Basic and OS of the BBC Micro, despite repeatedly being told by all and sundry that both are excellent examples of the systems programmer's art.

Indeed they are, but one of the areas in which it would be possible to improve the BBC Basic would be to allow a means by which the 'potted interrupts' of the BBC OS, the Events, could cause control to pass around a Basic program.

Similar things are allowed in the MSX machines, where ON SPRITE interrupts allow control to be passed to Basic subroutines when sprites collide. The subroutine is executed and control then passes back to the point in the program where the interrupt occurred. The various instructions such as AFTER and EVERY in Locomotive Basic on the Amstrad allow very effective Basic 'interrupts'.

This isn't an easy task on the BBC Micro, but I hope that this article will give you some pointers as to what can be done in harnessing Events to Basic.

For those of you not at home with the Events on the BBC Microcomputer, a short introduction. Simply put, they allow program execution to be interrupted when a particular 'event' occurs, such as a key being pressed, a complete screen being displayed or a centisecond timer 'timing out'.

For any of these events to be acted upon, they must first have been enabled by FX14. They can be disabled by FX13. If enabled, then on the detection of the event control passes to the machine code routine whose start address is in the Event Vector, at &220 and &221.

This routine then saves the 6502 registers, performs whatever task you want doing, restores the registers and then executes an RTS instruction to finish off. Details of the Events can be found in the Advanced User Guide or the standard BBC User Guide.

I won't dwell on these, as they've already been covered in details by these two publications. However, as an example, look at **Listing 1.**

The routine simply increments L% whenever a key is pressed; the REPEAT... UNTIL loop simply prints out L% repeatedly, and so by pressing keys you can see L% being updated by the event handling machine code. To disable the key press event, *FX13,2. Note that I haven't bothered checking whether the Event that caused the Event Handler Routine to be entered was, in fact, the key press one. As I haven't got any of the others enabled, I didn't think this necessary. However, with several Events enabled it will be necessary, and details on how to do this can be found in the BBC User Guides.

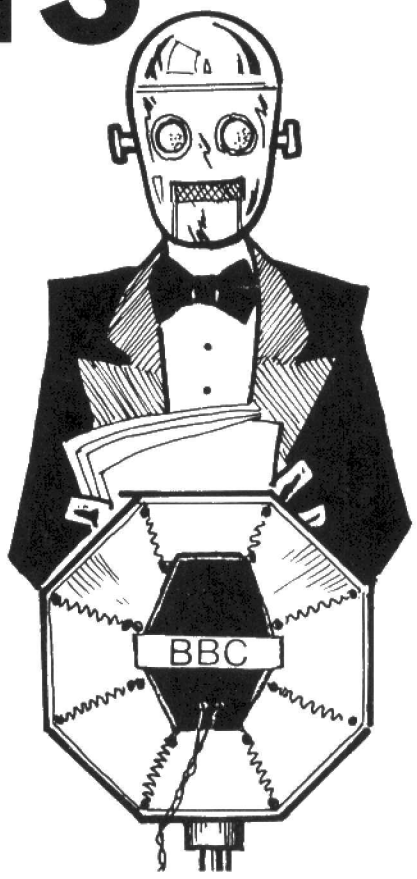
You can see that to utilise Events on the Beeb normally requires a short machine code program. So I decided to examine methods of getting the Event generated to interrupt a program and jump to another line in the Basic program, in a similar way to that in which the generation of an error in a running Basic program can cause control to jump to the program line given in the ON ERROR GOTO statement. The first program simulates an ON EVENT GOTO command, by making use of Basic's built in ON ERROR command.

PROBLEMS

There is a big problem, here, of course. Interrupting the execution of a Basic program could cause the Basic interpreter to be exited halfway through the execution of a single statement of Basic, thus leaving things in a bit of a mess.

It's also necessary to take care of the Event and exit the Event Handler with an RTS instruction to keep the operating system of the BBC Micro happy. So, the Event Handler must do something to interrupt Basic as soon as it's finished the current statement. The easiest way to do this is for the Event Handler to set up an Escape condition, with a flag to differentiate this condition from a real escape condition set up by pressing the Escape key.

We then need to modify the Error Handler to assign a new error number to this 'Event Error'. This is done in **Listing 2.**



'We interrupt this program . . .'

PROGRAM 1

```
100 REM demonstration of the key press
110 REM Event on the BBC Micro
120 REM BASIC II and OS 1.2 is assumed
130
140 PROCassemble
150 L%=0:REM zero key press counter
160 REPEAT
170 PRINT L%:REM print key press count
180 UNTIL FALSE
190
200 DEFPROCassemble
210 REM assemble the code to page A
220
230 FOR pass=0 TO 2 STEP 2
240 P%=&0A00
250
260 [OPT pass
270 .event
280 PHA             \ preserve the registers
290 TXA:PHA
300 TYA:PHA
310 PHP
320
330 \ *** service the event ***
340
350
360 LDA &430        \ add 1 to L%
370 CLC             \ low bytes
380 ADC #1
390 STA &430
400 LDA &431
410 ADC #0
420 STA &431
430
440 \ *** restore the registers ***
450
460 PLP
470 PLA:TAY
480 PLA:TAX
490 PLA
500 RTS
510
520 ]:NEXT
530 ?&220=event MOD 256:REM low byte
540 ?&221=event DIV 256:REM high byte
550 REM above lines set the Vector up
560 *FX14,2
570 REM line 400 enables appropiate
580 REM Event
590 ENDPROC
```

Once RUN, the machine code shouldn't be re-assembled as this can cause difficulties.

In this program, the Key Press event will cause an error with ERR=250, and a REPORT message of 'Event'. It can then be treated like any other Basic error and can be trapped with the Basic ON ERROR. This is done by lines 1010 to 1060.

The Event causes control to be passed back to line 230, after updating the variable 'event%'. Note how any other error causes the event to be disabled, and how we re-enable the event in line 1120 after it is turned off in the machine code. Any other event can be used, including the user defined Event, by altering the Event Number used in the FX calls.

Be warned, though, that an event that occurs too often will be useless as the Basic interpreter will be forever executing the Event routine and nothing else!

Now, there is nothing to stop you using the ON ERROR GOSUB construct to get a subroutine executed whenever an Event occurs. But, there is a snag; FOR . . . NEXT loops are restarted from scratch should this happen.

But, REPEAT . . . UNTIL, PROCedures etc. appear to be unaffected, so ON EVENT GOSUB is very useful for updating character positions on a regular basis in games, etc. **Listing 2** can be easily modified to demonstrate this by the below alterations:

190 ON ERROR GOSUB 1010
1150 RETURN:REM go back to whence we came!

MORE PROBLEMS

I did attempt a program that gave an ON ERROR GOSUB within a FOR . . . NEXT loop without losing track of where we were. Unfortunately, I haven't cracked this problem yet, but I offer **Listing 3** which works, but not always.

The problem is simple; although a suitable entry has been set up on the subroutine stack, it sometimes appears to be corrupted in some way, causing execution to continue not at the next statements but somewhere within the next statement, thus causing an error such as 'Mistake'.

I offer the listing so that someone out there with more ability than me can provide a solution. First, though, the program.

Here, the routine causes the subroutine whose line number is stored in 'linelo' and 'linehi' to be entered when an Event takes place, the jump in control occurring after the statement that is currently being executed is completed.

Once the subroutine is done, the RETURN causes command to pass back to statement following the statement which was interrupted. Run the program and try pressing a key a couple of times. If it crashes, try again. I've had some very long runs of the program without crashes. As with the ON EVENT GOTO program,

PROGRAM 2 Continued

```
100 REM **ON EVENT GOTO simulation***
110 REM **Joe Pritchard**************
120 REM **September 1985**************
130 REM **Active events cause an*****
140 REM **'error' with ERR=250*******
150 REM **which is trapped by usual**
160 REM **ON ERROR GOTO construct****
170 REM *** BASIC 2 ONLY ************
180
190 ON ERROR GOTO 1010
200
210 event%=0
220 PROCassemble
230 FOR I=0 TO 20
240 PRINT I
250 NEXT I
260 GOTO 230
270 RETURN
280
290 REM** assemble the program*******
300
310 DEFPROCassemble
320 FOR I=0 TO 2 STEP 2
330 oldvec=?&202+256*?&203:REM
    get address
340 REM of old error handler
350 P%=&0A00
360 [OPT I
370
380
390 .event          \ event handler
400 SEI             \ disable interrupts
410 PHA
420 TXA:PHA
430 TYA:PHA
440 PHP
450 LDA #125        \ set Escape Condition
460 JSR &FFF4
470 LDA #1          \ set a flag in zero
480 STA &79         \ page
490 PLP
500 PLA:TAY
510 PLA:TAX
520 PLA
530 CLI             \ re-enable interrupts
540 RTS             \ done
550
560
570 .error          \ new error handler
580 SEI
590 LDY #0
600 LDA (&FD),Y
610 CMP #17         \ was error 'Escape'?
620 BNE out         \ if not finish
630 LDA &79         \ is flag set?
640 CMP #1
650 BNE out         \ if not, finish
660 LDA #0
670 STA &79         \ reset flag
680 LDA #124
690 JSR &FFF4       \ clear Escape condition
700 PLA:PLA:PLA     \ clean up stack
710
720 LDA #13         \ disable the event
730 LDX #2          \ of interest, in this
740 JSR &FFF4       \ example, key press
750 BRK             \ generate error now
760 EQUB 250        \ with ERR=250
770 EQUS "Event"+CHR$13 \ message
780 EQUB 0
790
800
810 .out            \ finish via the old
820 CLI             \ error handler
830 PLA
840 PLA
850 PLA
860 JMP oldvec
870
880
890
900
910
920
930]:NEXT
940 ?&202=error MOD 256: REM set up new
950 ?&203=error DIV 256: REM
    error handler
960 ?&220=event MOD 256: REM set up Event
970 ?&221=event DIV 256: REM routine
    address
980 *FX14,2
990 REM Enable key press interrupt
1000 ENDPROC
1010 REM*** ON ERROR routine********
1020 REM*** Event 'error' has ERR=250
1030
1040 IF ERR<>250 THEN REPORT:PRINT" at
     ";ERL:*FX13,2
1050 IF ERR<>250 THEN END
1060
1070 REM***get this far and it's an***
1080 REM***event, so act on it********
1090
1100 PRINT "Ouch, an Event!!"
1110 event%=event%+1
1120 *FX14,2
1130 REM *** re-enable the event if***
1140 REM *** necessary ***************
1150 GOTO 230 : REM go back to a line in
1160 REM program to continue execution
```

PROGRAM 3

```
100 REM *** ON EVENT GOSUB **********
110 REM *** Joe Pritchard  **********
120 REM *** September, 1985 *********
130 REM *** Has bugs in it  *********
140 REM *** but occasionally works **
150 REM *** BASIC II ONLY ***********
160
170 ON ERROR GOTO 1310
180
190 PROCassemble
200 ?linelo=310 MOD 256
210 ?linehi=310 DIV 256
220 REM lines above set up line of
230 REM subroutine to go to on Event
240
250 FOR I=0 TO 20
260 PRINT I
270 NEXT I
280 GOTO 250
290
300
310 *FX13,2
320 PRINT "Hello"
330 PRINT "That was an Event!!"
340 *FX14,2
350 RETURN
360
370
380 DEFPROCassemble
390 FOR I=0 TO 2 STEP 2
400 oldvec=?&202+256*?&203
410 P%=&0A00
420 [OPT I
430
440
450 .event          \ generate Escape as
460 SEI             \ before
470 PHA
480 TXA:PHA
490 TYA:PHA
500 PHP
510 LDA #125
520 JSR &FFF4
530 LDA #1
540 STA &79
550 PLP
560 PLA:TAY

570 PLA:TAX
580 PLA
590 CLI
600 RTS
610
620
```

'These routines enable an event generated to interrupt a program and jump to another line in the Basic program'

only assemble the machine code once. The comments about Events given there also apply here.

I hope that this article has given you something to think about; the ON EVENT GOTO routine can be incorporated into your own programs with no alteration except for specifying which Event you want to use. You could even harness interrupts generated by, for example, the User VIA by using these interrupts to generate a User Event, as described in the Advanced User Guide.

As to the last program, maybe you can see a solution that I can't; I wish you luck.

Although the programs are written with Basic II in mind, Basic I machines can be used if ROM addresses are changed and EQUB and EQUS are replaced. ROM addresses &9970 and &8B9B in Basic II are &9942 and &8B0C in Basic I.

EQUB can be replace by

]:?P%=value:P%=P%+1:[OPT option

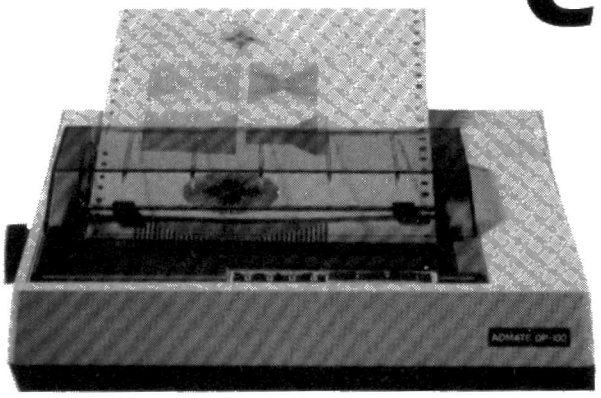
EQUS can be replaced by

]:$P%=string$:P%=P%+LENstring$:[OPT option

PROGRAM 3 Continued

```
 630 .error        \ check the error to see
 640 SEI           \ if it was caused by Event
 650 LDY #0
 660 LDA (&FD),Y
 670 CMP #17
 680 BNE out
 690 LDA &79
 700 CMP #1
 710 BNE out
 720 LDA #0
 730 STA &79
 740 LDA #124
 750 JSR &FFF4
 760 PLA:PLA:PLA
 770
 780 .gosub          \ if Event, come here
 790 LDA &0B:LDY &25 \ set up return address
 800 STA &5CC,Y      \ on the GOSUB stack
 810 LDA &0C:LDY &25 \ ready for return
 820 STA &5E6,Y
 830 LDA &25
 840 CLC
 850 ADC #1
 860 STA &25         \ update the GOSUB counter
 870 LDA linelo:STA &2A \ use ROM routine
 880 LDA linehi:STA &2B \ to find the address
 890 LDA#0              \ of the line we
 900 STA &2C            \ want control to go to
 910 STA &2D
 920 JSR &9970
 930 BCC test1
 940 CLI
 950 RTS               \ if line not in program
 960
 970
 980 .out
 990 CLI
1000 PLA
1010 PLA
1020 PLA
1030 JMP oldvec
1040
1050
1060
1070 .test1       \ sets pointers
                  to correct
1080 SEC           \ position
                   in the program
1090 LDA &3D       \ line and
                   then.....
1100 SBC #3
1110 STA &0B
1120 LDA &3E
1130 SBC #0
1140 STA &0C
1150 LDA #1
1160 STA &0A
1170 CLI
1180 JMP &8B9B     \ continues
                   the execution
1190
1200
1210
1220 .linelo EQUB 0
1230 .linehi EQUB 0
1240 ]:NEXT
1250 ?&202=error MOD 256
1260 ?&203=error DIV 256
1270 ?&220=event MOD 256
1280 ?&221=event DIV 256
1290 *FX14,2
1300 ENDPROC
1310 REM *** ON ERROR ROUTINE ***
1320 *FX13,2
1330 REPORT:PRINT " at ";ERL
```


Admate DP100 NLQ dot matrix printer from Cirkit



As reviewed in this issue, newly imported, it is a compact Centronics interface dot matrix printer designed to suit the requirements of office, personal or home use. As well as NLQ print mode it supports normal (Pica) and Elite characters, plus enlarged and condensed printing, superscript and subscript. Italic fonts are available for most print modes, as is underline.

The character sets are among the most extensive available; along with 192 ASCII characters (96 normal, 96 italic) and JIS characters the DP-100 supports 103 semi-graphic symbols and has US, UK, German, French, Swedish, Italian, Spanish, Danish and Greek character sets, the latter making this printer extremely useful for printing out mathematical text without fuss.
The DP100 is Epson compatible and printer control is by means of standard ESCAPE codes.

Print width is 80 columns in normal characters and the print speed is 100 characters per second, bi-directional and logic seeking. High resolution bit-image dot graphics are supported at 640 dots/line and the vertical resolution is far better than that of many other printers - line spacing is programamable in increments of 0.118mm (1/216in), 0.35mm (1/72in), 3.18mm (1/8in) or 4.23mm (1/6in).

The printer accepts either fanfold, single sheet or roll paper, with adjustable sprocket and friction feed, a self-stacking paper basket is included. The Admate DP-100 is exceptionally good value for money, a printer with features worth much more than its price.

Stock No. 40-90100 Price **£155.00**
Plus £5.00 post and packaging.
Printer Ribbon Stock No. 40-90101 Price £5.95

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Please add 15% VAT to all advertised prices and 60p post and packing.

THE MANDLEBROT

The Mandlebrot Set has been described as the most complicated object in mathematics, but it is generated by a simple algorithm and mapped to give an infinite variety of strange patterns. Jim McCartney shows how.

To generate graphics from the Mandlebrot Set, you will need a home micro, preferably one which can calculate in double (8-byte) precision, means for saving a text file to tape or disk, a printer which can do graphics work, a modest artistic gift and a degree of patience.

The algorithm is:

1. Let C = a complex number
2. Let C = C^2 + C
3. GOTO 2 until C > 2

Where C is large to begin with, the iteration will soon increase the value of C without limit, but there exists a set of numbers which do not behave in this way, for example, the real numbers between –2 and 0.25. Such numbers are members of the Mandlebrot Set. It has been proven that if the size of C ever exceeds 2, then iteration will increase C to infinity.

Complex numbers are in effect two-dimensional numbers, which have a 'real' component – the ordinary numbers we are all used to – and an 'imaginary' component, where the ordinary numbers are all multiplied by the square root of –1. Imaginary numbers are easily described as lying on an axis at right angles to an axis containing all the real numbers. A complex number is any number on the plane defined by the axes; it has a 'real' part and an 'imaginary' part. In algebra, it can be written as 'a + ib' where i is the square root of –1.

This may sound a bit like the usual x-axis and y-axis stuff we use for plotting graphs or doing co-ordinate geometry, but when we square a complex number a funny thing happens. Using ordinary algebra, we can write:

$$(a + ib)^2 = a^2 + 2aib + i^2b^2$$

But i is the square root of –1, so $i^2 = -1$, so

$$(a + ib)^2 = a^2 - b^2 + 2iab$$

$a^2 - b^2$ is the real part, and 2iab is the imaginary part. To add complex numbers, just add the real imaginary parts separately.

To find the size of a complex number, calculate the hypotenuse of the right-angled triangle formed, or the distance from 0 + i0: if s is the size, then $s^2 = a^2 + b^2$

Now apply these rules to the algorithm given above. You can forget about 'i' as far as the computer is concerned; just apply the unusual multiplication rules. The following procedure will do the job in any language:

```
Let all variables = 0
Let V = imaginary part, U = real part.
T = the size, squared, N = number of
   iterations.
Do until T>= 4 or N = 1000:
   A = R – S + U (Real part)
   B = 2 * Q + V (Imaginary part)
   Q = A * B: R = A * A: S = B * B:
   T = R + S: N = N + 1
END
```

The number 1000 is arbitrary; but mathematicians reckon that if it hasn't made it by 1000, it isn't going to. I find 500 to be quite sufficient in my own experimenting.

Using this program, you can find whether a point is on the set or not. The Mandlebrot Set turns out to be a weird-looking object **(Figure 1)** which is symmet-

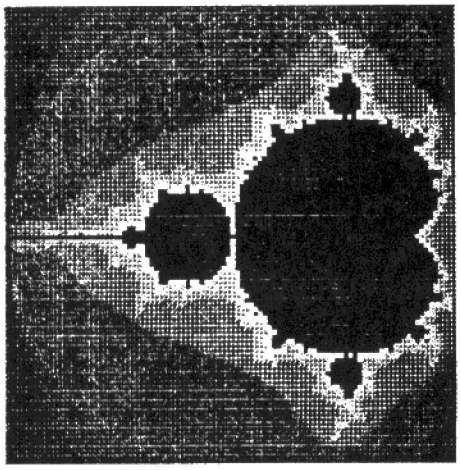


FIGURE 1

Mandlebrot Set graphics print: File B:1 .MND
Real = 2 Imag. = 1.25 Size = 100 Step = .025
Stop at 500 Ranges are:

499	500
0	1
1	2
2	4
4	8
8	16
16	32
32	64
64	128
128	499

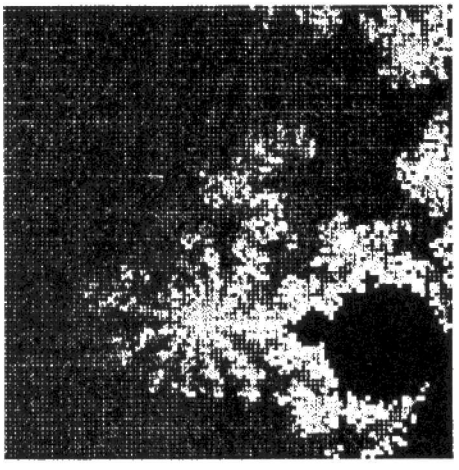


FIGURE 2

Mandlebrot Set graphics print: File B:3 .MND
Real = –.755 Imag. = .275 Size = 100 Step = .0005 Stop at 500 Ranges are:

499	500
0	15
15	30
30	50
50	75
75	100
100	150
150	200
200	250
250	499

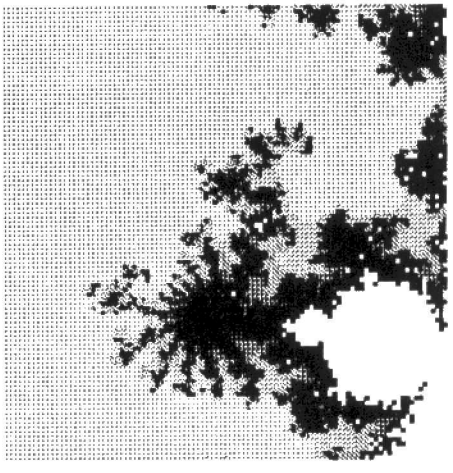


FIGURE 3

Mandlebrot Set graphics print: File B:3 .MND
Real = –.755 Imag. = .275 Size = 100 Step = .0005 Stop at 500 Ranges are:

200	499
100	200
80	100
70	80
60	70
50	60
40	50
30	40
0	30
499	500

SET

rical about the real (horizontal) axis, and which sprouts miniature versions of itself in several directions. However, the really interesting part, as far as pattern-discovery is concerned, is not on the set itself, but just off it on the fringes.

'Mathematicians investigating the function on mainframe machines have found no limit to the amount of detail which can be resolved'

Mandlebrot found that the number of iterations required does not rise smoothly to infinity as the edge of the set is approached (as you might reasonably expect) but fluctuates in a totally unpredictable manner. By making a contour map of N, we find the most extraordinary patterns developing. This can be done by calculating N for all the points, at suitable intervals, over a rectangular area near the set. By making the interval between numbers smaller and smaller, we can in effect magnify the bit we are looking at, until such time as the calculation precision gives out. Mathematicians investigating the function

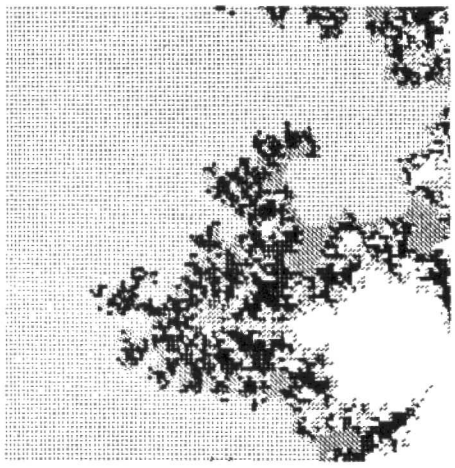


FIGURE 4

Mandlebrot Set graphics print: File B:3 .MND Real = .755 Imag. = .275 Size = 100 Step = .0005 Stop at 500 Ranges are:

65	70
60	65
50	60
70	80
40	50
80	100
30	40
100	200
0	30
200	500

LISTING 1 (MSBASIC) CALCMAND

```
100     'CALCMAND.BAS program to calculate points on the Mandlebrot Set
        ***************************************************************

110     DEFINT C-N: DEFDBL A-B,O-Z: DIM H(10)
        'C-N are integers, others are Double Precision
120     D=1: E=2: F=4:  PE$=CHR$(27)
130     PRINT PE$"E"                    'clear screen

140     PRINT "MANDLEBROT SET SCAN": PRINT
150     INPUT "Do you want the matrix printed? ",PM$: PRINT
160     LPRINT CHR$(15)         'set condensed print on Epson
180     INPUT "Output file no.";B: PF$="B:"+MID$(STR$(B),2)+".MND":PRINT

200     PRINT "Starting Points for the Mandlebrot Set Scan:":PRINT
210     INPUT "Real Part      ",X
220     INPUT "Imaginary Part ",Y
225     INPUT "Matrix size    ",C: C=C-1
230     INPUT "Step           ",Z
235     INPUT "Stop after     ",M

237     LPRINT "Mandlebrot Set Scan:"
238     LPRINT "Real=";X;" Imag.=";Y;" Size=";C+1;" Step=";Z;" Stop at ";M
240     OPEN "O",£1,PF$
250     PRINT £1, X;",";Y;",";C+1;",";Z;",";M
260     PRINT
300     FOR K=0 TO C:
                PRINT K: PRINT PE$"A";:
                V=Y-Z*K:
                FOR J=0 TO C:
                        U=X+Z*J:
                        N=0:A=0:B=0:Q=0:R=0:S=0:T=0:
                        WHILE T<F AND N<M:
                                A=R-S+U:
                                B=E*Q+V:
                                Q=A*B:
                                R=A*A:
                                S=B*B:
                                T=R+S:
                                N=N+D:
                        WEND:
                        PRINT £1,N
310                     IF      PM$="Y"
                        THEN    P$=STR$(N): P$=SPACE$(5-LEN(P$))+P$:
                                LPRINT P$;: GOTO 320
315                     H=N*10: H=H/M: H(H)=H(H)+1
320             NEXT:
                IF PM$="Y" THEN LPRINT
325     NEXT
330     IF      PM$="Y"
        THEN    390
340     LPRINT "Distribution of points: up to": LPRINT
350     FOR H=0 TO 9:
                LPRINT,(H+1)*M/10-1,H(H):
        NEXT H:
                LPRINT,M;"+",H(10)
390     LPRINT CHR$(18): LPRINT 'normal print mode again
400     CLOSE 1: END
```

LISTING 2 (MSBASIC) PRINTMAN

```
100     'PRINTMAN.BAS program to illustrate Mandlebrot set
        ***************************************************


110     DIM P(9,4),Q(1,9)       'print densities & sort array
120     DATA 7.7,7.7,7
121     DATA 7.5,7.3,7
122     DATA 7.5,6.7,2
123     DATA 6.3,5.2,5
124     DATA 2.5,2.5,2
125     DATA 2.0,5.2,1
126     DATA 1.4,0.2,0
127     DATA 0.2,0.4,0
128     DATA 0.0,2.0,0
129     DATA 0,0,0,0,0:         'all the shades of grey
140     FOR J=0 TO 9:
                FOR K=0 TO 4:
                        READ P(J,K):
                NEXT:
        NEXT
150     E$=CHR$(27)
200     PRINT E$"E"                     'clear screen
250     PRINT "Mandlebrot set graphics printout:":PRINT
260     INPUT "Input File Number: ";G%
270     PF$=MID$(STR$(G%),2): PF$="B:"+PF$+SPACE$(6-LEN(PF$))+".MND"
300     PRINT:PRINT"Enter the upper limits of the ranges you want in each
310     PRINT"shade of grey  (0=black, 9=white)":PRINT

320     FOR J=0 TO 9:
                Q$="Shade"+STR$(J)+" ":
                PRINT Q$;:INPUT Q(1,J):
        NEXT
        'specify the upper limits for each shade of grey

330     FOR K=0 TO 9:
                FOR J=0 TO 9:
                        IF      Q(1,J)>Q(0,K) AND Q(1,K)>Q(1,J)
                        THEN    Q(0,K)=Q(1,J)
332             NEXT J:
        NEXT K          'find the lower limit of each range

500     OPEN "I",£1,PF$         'the data file
510     INPUT £1,X,Y,C,Z,M
520     LPRINT "Mandlebrot set graphics print: File ";PF$
530     LPRINT "Real=";X;" Imag.=";Y;" Size=";C;" Step=";Z;" Stop at ";M
540     LPRINT "Ranges are:
550     FOR J=0 TO 9:
                LPRINT Q(0,J),Q(1,J):
        NEXT
```

on mainframe machine have found no limit to the amount of detail which can be resolved.

BASIC CALCULATIONS

I wrote calculation and plotting programs for this using a Sirius machine with MSBasic and an Epson FX80 printer, which can do graphics with some encouragement, plotting in ten shades from white to black. **(Listings 1 and 2).**

CALCMAND calculates the values of N over a range of a C by C matrix, and puts the results in a text file. You can choose the starting point, the step size, and the number of iterations. The scan is top left to bottom right, computer style, so that the real part increases and the imaginary part decreases, with the scan.

The Sirius is notoriously slow in interpreted Basic, so I compiled this to get a bit of speed out of it. Most machines will take some hours to complete a 100 x 100 scan; this involves 10,000 calculations of up to several hundred iterations each. You can speed things up by keeping the maximum number of iterations down. To do some quick exploring, use a 20 x 20 matrix and choose the option of printing the matrix values **(Figure 5).** You can then go over the interesting-looking sections – where N varies a lot – in more detail by increasing C and decreasing the step in proportion. If you don't use the matrix printing option, you will get a distribution of the values of N **(Figure 6)** which will give a guide to the values to use for grey shades in the printing program.

PRINTING

Because the calculation takes so long, and because it is necessary to experiment with grey shades to get the most pleasing result, I kept the print program separate, and ran it off a text file, so that the printouts could be repeated ad lib. The file contains all the necessary data on matrix size and so forth; you just need to select the grey shades. These don't need to be shaded according to the size of the numbers (see **Figures 2-4**) but can be arranged light-dark-light-dark etc, to give the best results. Surprisingly varied results can be obtained by this method. If you have a colour monitor or printer you can produce all sorts of attractive effects.

Figures 2-4 show a section of the set magnified 50 times, in various interpretations. **Figure 5** gives a preliminary scan on a section of this, magnified twice more, and **Figure 6** gives the same section in detail, with a total magnification of 500.

You can find more details of the mathematics and history of the Mandlebrot Set, and some very striking illustrations, in *Scientific American,* August 1985. Happy hunting, and be patient.

LISTING 2 (CONTINUED)

```
600     C1=(C*5+1) MOD 256: C2=INT((C*5+1)/256)          'pin strikes control
700     DIM A%(C*5)
1000    LPRINT E$;"A";CHR$(3)              'set up line spacing on Epson
1010    M=0
1020    FOR J=1 TO C:
                FOR K=0 TO C-1:
                        INPUT £1,S:
                        FOR L=0 TO 9:
                                IF S>Q(0,L) AND S<=Q(1,L)
                                THEN M=L: L=9              'find the right shade
1022                    NEXT L:
                        FOR A=K*5 TO K*5+4:
                                A%(A)=P(M,A-K*5):
                        NEXT A:
                NEXT K                      'put the results in the print array
1025            LPRINT E$;"L";CHR$(C1);CHR$(C2);:
                FOR A=0 TO C*5-1:
                        LPRINT CHR$(A%(A));:
                NEXT A: LPRINT CHR$(0):
        NEXT J                                          'print each line
2000    CLOSE 1: LPRINT CHR$(12): LPRINT E$"@":END      'form feed & reset Epson
```

MANDLEBROT SET SCREEN (SEE FIGURE 5)

Real=-.724 Imag.= .263 Size= 20 Step= .00025 Stop at 500

20	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
23	22	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
64	37	26	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
54	73	48	24	23	22	22	22	23	23	107	23	23	22	22	22	22	22	22	22
96	75	32	27	26	98	24	24	25	130	87	28	23	23	22	22	22	22	22	22
75	96	104	49	36	83	46	26	84	47	42	60	25	23	23	23	22	22	22	22
71	344	87	58	45	37	32	30	57	94	91	31	26	24	24	23	23	22	22	22
149	115	76	58	57	74	35	73	62	98	95	167	111	26	24	24	23	23	22	22
52	113	60	92	47	49	41	43	88	65	58	50	38	28	26	25	24	23	23	23
45	121	89	48	44	45	60	47	206	54	47	71	36	35	112	35	28	24	23	23
42	45	69	69	43	39	49	67	124	55	43	187	48	77	125	35	28	25	24	24
47	47	61	80	68	38	36	37	43	71	39	91	90	69	73	72	26	25	24	24
82	88	59	77	59	36	34	34	35	36	36	46	58	49	81	70	26	25	24	24
42	45	36	36	112	34	33	33	33	34	35	37	41	57	84	30	27	25	24	24
35	34	33	33	32	32	32	32	33	34	35	37	54	64	140	64	29	26	25	24
34	33	33	32	31	31	31	31	32	33	61	39	41	51	116	35	31	26	25	24
34	33	32	31	31	31	31	31	31	33	59	48	64	64	99	28	27	26	25	24
37	32	32	31	31	30	30	30	30	31	35	100	80	99	29	27	26	26	25	25
158	32	31	31	30	30	30	30	30	30	30	31	30	30	28	27	26	26	25	25
122	32	31	30	30	29	29	29	29	29	28	28	28	28	27	26	26	26	25	25



FIGURE 5

Mandlebrot Set graphics print: File B:4 .MND Real = .724 Imag. = .263 Size = 20 Step = .00025 Stop at 500 Ranges are:

110	500
90	110
80	90
70	80
60	70
50	60
40	50
30	40
25	30
0	25

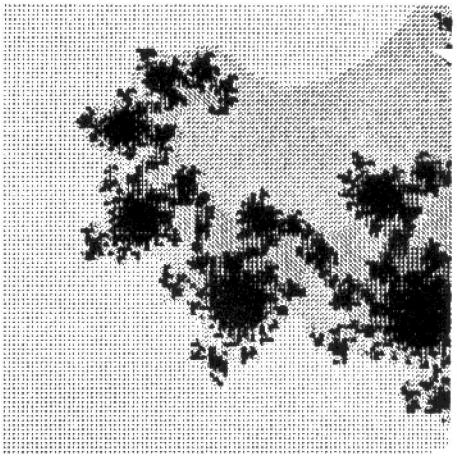


FIGURE 6

Mandlebrot Set graphics print: File B:5 .MND Real = .724 Imag. = .263 Size = 100 Step = .00005 Stop at 500

Ranges are:		Distribution of points up to:	
110	500	49	3001
90	110	99	5862
80	90	149	838
70	80	199	211
60	70	249	65
50	60	299	15
40	50	349	3
30	40	399	4
20	30	449	0
0	20	499	0
		500+	1

COMMS NEWS

Essential information, gossip and news for wireheads and data crackers.

Italy opts for Prestel standard

In a deal worth £20 to £25m over the next five years, Italy's public phone company has adopted the Prestel standard of videotext services with the purchase of GEC equipment, Prestel operating software – and the Prestel-based Micronet database.

Italy is the last big European country to select a videotext standard, and its decision to go for Prestel bodes well for future sales into less developed markets.

The move means that France and Germany are the only significant European markets which haven't adopted the Prestel format, and their systems have up to now been incompatible with Prestel. However, GEC is offering the Italians a system which can also support German-style Bildschirmtext terminals, thus providing a viable option for countries where the German system is dominant.

The deal also brings a useful cash bonus to Prestel, which jointly developed the operating software with GEC and earns a royalty on any sales.

Tandata frees the executive

Modem manufacturer Tandata has branched out into computers with a one per desk rival called the PA – for Personal Assistant.

This "voice/data communications workstation" is built round the 16-bit 80C88 processor, with 64K RAM and a hefty 128K ROM housing the very basic word processor and spread sheet software. The device drives a colour monitor and has a restrictive 40 column x 2 line LCD unit integral in the keyboard.

Its most remarkable feature, however, is its lack of any magnetic storage device, an omission defended to us by Tandata boss Roy Pendleton as freeing the executive from worries about buying disks, formatting disks, learning disk commands, and accidentally erasing disks.

Instead, the PA relies on battery-backed CMOS RAM for data storage, with the option to dump overflowing files to tape via the cassette port or to a PC disk through the twin RS232 outputs.

Aware of immediate comparisons with the OPD, notably on the PA's lack of top quality software, Basic Interpreter, and telephone handset, Pendleton defends his new baby on price (£999 for the 64K entry level device, compared with £1625 for the colour OPD without applications software), ease of use, and compactness.

He also reckons that the OPD's handset is a liability in most firms, and that the PA route of handset input socket, auto-dialer, phone book, and internal loudspeaker/mike offers useful extra features without destroying the matched network of company PABX and dedicated executive handsets.

BIX micro info service on line

Biggest comms news in the US is undoubtedly full operations for the much-discussed network from Byte magazine – America's most prestigious (if not downright boring) computing organ.

Since November 1st, the Byte Information Exchange (BIX) has been on line in the New York, Boston, San Francisco and Chicago areas at 300 and 1200 baud Bell tones, and from 1 January is accessible to anyone anywhere via Tymnet.

Byte will mail-shot its subscribers this month (December) with info on the new net, offering concessionary sign-up fees of $25 instead of (for the rest of us) $39.

Early informed guesswork indicates that BIX will operate as an upmarket version of Plink or the Source, with lots of rarified info for your typical square-headed Byte reader.

Anyway, full details of the set-up are obtainable from Byte Information Exchange, Byte Magazine, PO Box 372, Hancock, NHO3449, USA. Tel: 010 603 924 9281.

Back-chatting on screen

Micronet's Mainframe Chatline service, exclusively described on these pages two months ago, is now operational.

Described as a "24 hour, multi-channel CB emulator", the new Chatline, claims Micronet, allows the configuring of an unlimited number of channels – and the company is asking users for ideas for special interest groups, with the Net's vocal gay lobby already putting in their claim.

Two types of Chat channel are provided. One is a speeded up version of Micronet's old system, with a cycle – or daisy chain – of Prestel pages being successively over-written as new messages arrive. Dubbed Daisy-Chat, this version gives an archive of old messages, but requires the user to key a request for the latest material.

Quick-Chat, on the other hand, exploits Prestel's existing auto-refresh option to allow the user to sit on a frame and watch new messages successively overwrite the existing material. No key pressing is required, but there's likewise no archive of material to give Chatline users a flavour of the conversation.

Micronet is giving free use of its half-a-dozen Quick-Chat channels (Daisy-Chat costs 2p a message), and working hard on the upgrade revealed on these pages two months ago – the Prestel screen split into four horizontal windows, each containing a Chat message, and each window successively overwritten by incoming material.

Micronet say the new Quick-Chat will cost 2p a message, but we've a funny feeling (remember where you heard it first) that the price will turn out to be less.

New service from Timefame likely

Despite evasions from MD Roy Norman, rumours of the imminent appearance of an alternative network for Prestel Information Provider Timefame International continue to circulate, with talk of a new service called Interlink appearing next spring.

Latest informed speculation is that the new network has been developed thanks to £200,000 funding from the Millman brothers who established the successful Plink network in the US.

Timefame seem unlikely to leave Prestel at present, their role on the US-backed set-up being restricted to management.

Quizzed on the new developments, Norman told us that details of the new system would depend on decisions yet to be made by his (un-named) US backers, but revealed that the new set-up would be a Prestel clone – ie. page-based, colour, available to standard modems – but with undisclosed improvements and running on Olivetti hardware.

The thorny problem for all would-be Prestel challengers of matching BT's 97% local call charge access seems unlikely to be solved by the new system; observers instead speculate on a Compunet-style arrangement of access nodes in major cities, with surcharged local nodes for remote users.

Other charges are likely to be a £5 signing-on fee, no time charges out of office hours, but prohibitively high ones (or perhaps no access at all) during daytime.

The network on which the new database will reside hasn't yet been revealed, though we understand that Timefame were at one point exploring a link with ADP, which supports Compunet, but withdrew on discovering the extent to which overloading of the ADP system caused frame access delays to Compunet users, and anyway provided only a very modest level of local call access.

The content of the new system has not yet been fixed, though we assume a micro-computing angle would predominate, along with business services and much emphasis on electronic mail.

Armchair banking

No more queuing at your local bank, and it's open on Saturday and Sunday. David Cowan investigates a new service for computer users.

Futuristic scenarios tell us how we will do our shopping, banking, work and other activities from our armchairs. Some of these things are beginning to happen now, but how realistic is such talk? In the world of banking the future seems to have successfully arrived – thanks to the efforts of the Bank of Scotland.

The Bank of Scotland is not the first but certainly the most comprehensive home banking service in Britain, and the reasons for its launch early in 1985 give an interesting pointer to the future of banking and commerce. The Bank of Scotland, in common with most banks, is expanding its services and customer base.

Ian Graham, customer services manager of the Bank of Scotland in Edinburgh, explains: "We wanted to attract customers in England, and to do so with bricks and mortar would have been a very expensive business. However, with a computer it becomes cheaper and easier. About half of our computer users are in England, which indicates the success of the venture."

Work on the home banking project started two years ago when other banks were also considering a move into such a service. Tests on the system started in June of 1984 using the bank staff as guinea pigs, and once tested the launch was made into the commercial market in January 1985. Constant development has been done, mainly on graphics and instructions to improve user friendliness.

Access to home banking can be by the standard Prestel adaptor (£90) but most users at present have a computer. The user needs a computer and modem along with the appropriate software to access Prestel. Ian Graham explains why: "By using Prestel the user is charged at local rates for telephone time, thus making a big reduction in costs of home banking. The user also has access to the usual run of Prestel services."

Initially the customer uses the Prestel code to gain access. The Prestel user who is not banking with the Bank of Scotland, in common with most Home Banking gateway as far as an information board. He can go no further without a banking code.

Having got thus far the user now has to operate three sets of codes. First his home banking number consisting of four digits. When typing these digits in, the code is echoed back only as a set of dashes, preventing anyone from seeing the code on screen and increasing security; the user can make three attempts before the system will close down on him for security checks.

PASSWORD

To get the code in the first place the user is confronted with the four digits 9999 which he then alters to his own code. Once this has been done he sends a slip to the bank to notify that change, a change he can make as often as he likes. The bank does not need to know the code, only that it has changed. This code or password can be of any length from four to eight digits.

Once the code has been chosen for the first time and the slip sent off, the user has to wait for two working days after the bank has received notification that a code has been chosen. The other two codes are usually used by a bank's client – that is, the current account number and the individual's Keycard number (ie. his cash-card number for EFT).

To access Prestel, the Bank of Scotland gateway, one's set of codes and to gain entry to one's own account takes about two to five minutes. This is all done on the local rate of BT charges. The security is sound enough since three codes are needed and all the characters on the keyboard are available for the user's own code.

The home user has a number of options once he has accessed his accounts, and the business user has an additional option for cash management. The user can check his balance, the value of pending cheques and direct debits, and bank charges pending, and interest accrued, the value of inter-

'With Prestel, the user is charged at local rates for telephone time, making a big reduction in the cost of home banking'

account transfers pending, the user's overdraft limit (if any), and how much cash is available to the user. He can also check three months of account records up to a maximum of 100 items.

A new cheque book, printed statement or information on services available to users can be ordered via the computer under this system. The only thing it cannot do is give cash immediately or attribute non-existent cash to the account.

However, the user with more than one account can transfer money between them.

To pay a bill the bank must already have details of the account to whom the bill is to be paid. The user can then enter the amount and date payable. The bill must be ordered three days beforehand and no later than 30 days ahead. Thus, the user can order all bills for the month to be paid on the one session with the computer but for different days of the month. At a later date these bills can easily be adjusted or cancelled, as the user pleases.

Business users can, for an extra monthly fee make use of the cash management report. This is a day-by-day report of entries and withdrawals. That is, yesterday, today, and the next two days. This will inform the user of the balance each day, and if it seems that the account will be overdrawn for a day or two the user can transfer money from another account to avoid charges.

This is a service which was previously very expensive and was used only by large companies.

Home Banking is open to users from 8 a.m. until 1 a.m. A Help Desk is available for advice during Home Banking hours. On Sundays the service opens at 8 a.m. and closes at 11 p.m.

COST CATEGORIES

Once the user has finished banking he can either return to Prestel services or to the Prestel index and end the session. To use the Home Banking facility the user must subscribe to Prestel. This does add to the cost, but the Bank of Scotland argues that most computer users will want Prestel anyway.

There are three categories of cost involved. First, the British Telecom bill; this is at local rates, the same as for Prestel. Second, the Prestel rates, which has no computer time charges if users do their banking after 6 p.m. on weekdays or after 1 p.m. on Saturday or any time on Sunday. The charges are the standard Prestel charges, with the subscription at £6.50 per quarter (personal) and £18 per quarter (business).

The third category of charge is made by the bank itself. Of

course the user has to open an account before using the facility. The subscription fee is £2.50 per month for the personal user and £5 for the business user per month. Additionally the business user may use the cash management module at £5 per month, giving a total of £10 per month. This extra module is not available to the personal user at all.

As long as the account stays in credit there are no charges for transactions, but any debits on the current account caused by the facility are liable to charges. An operating cost of 10p is added for each standing order set up on the Home Banking facility. All these charges include VAT.

'From the home terminal a customer can check a balance, make outstanding orders, pay bills, transfer money between accounts, order a cheque book . . .'

The Bank of Scotland has creamed off the computer user market, mostly based in England, thus justifying the research costs. All software was developed by the bank at its computer centre, except for one package. This was a Friend Provident package which cuts down the CPU time but doesn't affect the user at all.

Computer users will have the necessary hardware for the system: computer, modem, BT socket (PST square type), communications software. The non-computer user can get an adaptor just like the Prestel one at £90 for use with television and telephone.

CAUTIOUS

Other banks see the logic behind the Bank of Scotland move, but are being more cautious and perhaps awaiting the results of the Bank of Scotland move before launching their own systems. In America and France less caution has been employed by the major banks. The main problem in both countries is the geographical dimension.

Both are physically larger than Britain and so the 'phone charges are greater. Neither has the equivalent of Prestel, which reduces the charges because of a local rate. So the use of these banking systems is made more expensive by the telephone companies, even more so in the United States than in France.

Marketing Home Banking in these two countries is difficult because the charges are necessarily higher and so fall into the same cost categories as the databases currently on the market. The Bank of Scotland has its database in Sighthill on the outskirts of Edinburgh, accessed by local rate calls. Such a system is unimaginable in the sheer expanse of America. The result there has been small numbers of subscribers to regional banks.

What of the other British banks? A few are dipping their feet into the water. The second largest scheme is the Midland Bank's, which has somewhere in the region of 1,000 subscribers to a London database. Since this is not by Prestel the telephone costs of such a system are high, but Midland may well aim for a similar approach to the Bank of Scotland.

If Home Banking is to succeed the question of operating costs are paramount, otherwise it is just another set of expensive service charges to be added to the banking charges already levied by traditional methods. This won't bother the computer enthusiast too greatly but it will concern the majority market of people without computers, or computer users without the enthusiasm for the communications capability of their machines.

Once all the banks are into the home banking idea the obvious use will be for transferring money between banks and carrying out business in that way. This is the shape of the future where cash will be of less use and perhaps be phased out if all people use home banking – but that is still a long way off.

It does not seem that the Bank of Scotland has done too much too soon, for the computer has saved them building a customer base using bricks and mortar.

A rival to BT Gold

One-to-One is the latest electronic mail service for personal computer users, but Gary Evans finds few improvements over Telecom Gold.

The use of electronic mail systems, both by businesses and individuals, is one of the most rapid growth areas encompassed by the joint technologies of telecommunications and computing.

Prestel, one of the first such services, although more data than e-mail orientated, has at last started to trade at a profit on its day-to-day operations and there are many more organisations starting to gain a foothold in this market.

One-to-One is just such a service offering a range of facilities associated with e-mail. *Computing Age* took advantage of a free trial period to test the system and to assess its usefulness to the micro computer user.

The first point to make about e-mail service is that you can only communicate with other registered users of the system.

Most of the users of e-mail at present pass messages back and forth between members of a company, and the systems clearly have a long way to go before they replace conventional mail.

For this to happen leading organisations such as banks and building societies will have to latch onto the system. Even BT, which has a stake in Telecom Gold has, to our knowledge, no publically quoted e-mail contact points.

For commercial reasons it is not possible for a user of 'Gold, for example, to directly contact a user of One-to-One, although it would be possible for 'Gold users registered for telex transmission to send mail to a One-to-One subscriber.

Computing Age's e-mail hardware consists of a BBC micro computer plus Telemod 2/Prism 1000 modem. The choice of modem restricts us to operation at 1200/75 baud. Disk-based Micronet version 4 software is used to log onto Prestel-type services and Computer Concept's Communicator ROM used for scrolling services.

One-to-One offers a direct dial 1200/75 baud link in the London area and this was the route we chose to gain access to the service. Users in other parts of the country may make use of the PSS network and, in the majority of cases, dial in at local call rates, although there will be an associated PSS charge.

The default parameters of the Communicater software closely match those required by One-to-One – the only parameter that needs modifying is the ECHO ON/OFF flag. This needs to be set to ON as the One-to-One link is half duplex.

Having set up the hardware we dialled into the system and entered our eight digit account number at the prompt. Telecom Gold uses a six character sequence of numbers and letters to identify their customers, and this seems far easier to remember than a string of numbers.

The user password is entered immediately after the account number. If correct the One-to-One computer will 'erase' the log-on line for security reasons. Incidentally, it is possible to log-on to Telecom Gold in a single line by following the account number with the user password, although this will then be echoed to the terminal and will not be erased. Do not use this short cut log-on sequence if it is likely that someone will be looking over your shoulder.

ON THE BACKWATERS OF PRESTEL

Clive Williamson takes a cruise through the lesser known tributaries of the BT viewdata system.

After five years in operation Prestel, British Telecom's public viewdata service, is finally making a profit. The reason is undoubtedly the amazing growth in subscriptions from micro owners, who can use their personal computers and modems to get at the Prestel database without having to buy a special adaptor.

But apart from the micro magazines published electronically on the system, such as Micronet 800 and Viewfax 258, what attractions does Prestel offer the micro enthusiast, or anyone else for that matter? After all, it now has over 300,000 pages, or frames, of information.

The key fact is that over the years Prestel has developed by providing its services to specific groups of users. First of all, its immediate on-line editing facilities made it the perfect medium for the travel industry, who were able to keep up-to-date flight and bookings information on Prestel, and other viewdata systems like it. Travel agents all acquired terminals, and the system soon filled up with data from tourist offices, airline services and travel companies.

In the early days, Prestel was sold as a general information service too, and 'information providers' as they became known, included the Consumer's Association, *Time Off*, and *The Illustrated London News*. But the Prestel service never caught the public's imagination – expansion was painfully slow – and British Telecom was forced to close down several of its regional computers storing the database.

Then the microcomputer came along – in the nick of time, like the Seventh Cavalry. You can just imagine the smiles flickering on the faces of all the Prestel executives as they heard the distant sound of the bugle call. Micronet 800 was launched in 1983, and the system hasn't looked back since. Now around 45% of Prestel's 62,000 subscribers are home users, and many are part of Prestel Microcomputing, getting up-to-the-minute news, reviews, user group information, and special software and hints for their particular micros.

Prestel has obviously been inspired by the success of this specialist usage, and has gone on to establish, or encourage, home banking and shopping through the Bank of Scotland and the Nottingham Building Society, an education service for schools, a farming database and Citiservice, a 'live' business database, holding for example Stock Market information and currency exchange rates.

LOST ITS BALANCE?

But amid all this specialisation has Prestel lost its balance? The micro explosion came far too late to save some of Prestel's pages, and now that lots of the speculative information providers of the early days have pulled out, things are looking a bit bleak.

Where is the data on recreation and the arts? Where is the background to stories in the news, or details of exhibitions and TV and radio programming? 'Mostly on Teletext', I hear you cry. Technologically-minded television viewers have found the idea of Teletext more appealing than plugging in a micro and making a phone call to get at the information.

So where does that leave Prestel? How well does our public viewdata service supplement the specialist data with general information? The answer, unfortunately, is none too well, at the moment. Prestel's back pages are distinctly lacking in verve, wit, and usefulness. But amongst them are hidden some interesting gems, and it is to be hoped that Prestel's new-found profitability will encourage more information providers to get onto the system.

WHAT'S THERE NOW?

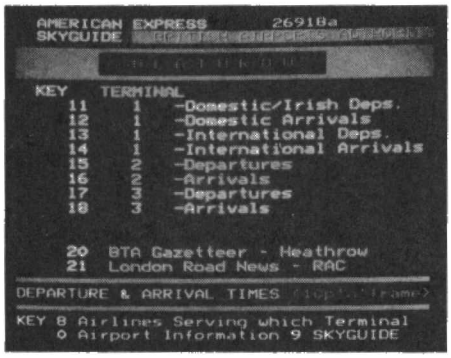
The main snag for anyone wanting to publish on Prestel is that if they are to make any money out of the frame charges, they have to offer a service that people need badly enough to feel like parting with anything up to 99p to see it!

Citiservice, for example, charges 7p per frame for much of their information, including exchange rates, while the Meteorological Office provides a detailed three-day weather forecast for 30p. Prestel holds government information from the DHSS, DOE and DTI; details of more than 70 *Which?* magazine car reports; nutritional advice and recipes from the Health Education Council; and details of all the major car-hire companies. Only Viewtel, on page 202, gives business, sport, travel, national, and international news, and claims to be the world's first national daily electronic newspaper.

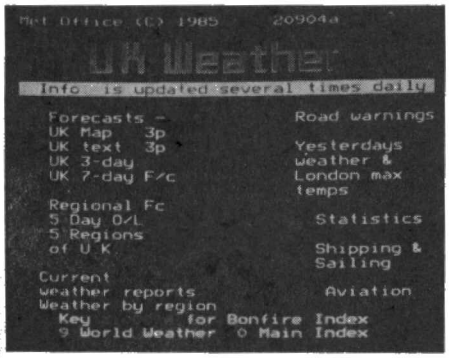
Using Prestel as a two-way system, there are response frames where written information or goods can be ordered, and the Mailbox and telex message services are easily used, though fairly expensive if you happen to be a slow typist whilst on line (amazing how quickly you can run up an enormous telephone bill). There is also the opportunity for frustrated artists to design and exhibit their own pages on Prestel.

Some local councils, such as Kingston-upon-Thames, have now established their own local databases and information services, and another handy form of data is the British Rail service on page 221, which includes timetables for some of the major intercity routes into London.

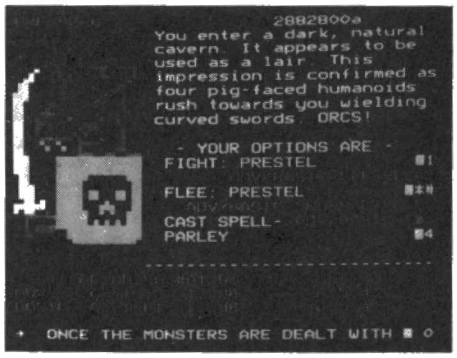
But at present coverage of the arts and music is little short of pathetic, and there is no true journalistic input in this area. Additionally, much of the data supplied on foreign countries is more like advertising than a potentially useful tool for research. There are some useful things to be found but the system has a long way to go yet.



SKYGUIDE One very specialised, but occasionally very useful source on Prestel, is the up-to-the-minute airport flight arrival and departure information given by American Express on Skyguide (Page 2691). The data is divided by airport, then broken down into terminals in the case of Heathrow, and costs 10p per access. If you are meeting a flight, and want to know what time the 20.00hrs BA flight 417 from Amsterdam is due in to Heathrow, you can find out easily by calling up these pages.



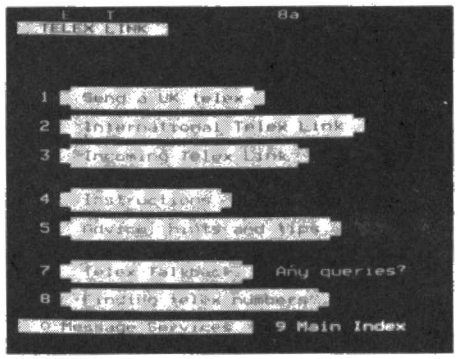
THE WEATHER An advantage of the immediacy of Prestel is that anyone needing accurate details about the current weather, or the latest prediction from the Meteorological Office, can find them (for a small price) on Page 209 or, easier to remember, via Page 11. In addition to providing general forecasts, the Met office also give 'actuals', ie. what is actually happening by area, a three day forecast, and special warnings about road conditions. Information of this sort can be extremely useful to local councils needing to think about gritting in the winter, and for anyone who has to plan outdoor activities several days ahead.



PRESTEL GAMES Obviously hoping to reach the compulsive games players amongst the micro-owning Prestel subscribers, Pages 136 gives access to a range of different game types, including sport, war, travel, word and adventure. The games company TSR has a large section on the database from Page 2882 where it is possible to play Dungeons and Dragons, although you often need some dice handy to decide on your next move – the computer doesn't do it for you! Some of the games on Prestel tend to be a little slow because of the restrictions imposed by the viewdata system, but graphics like the one above can make up for it.



STARLIGHT A subsection of Micronet 800, Starlight is one of the few specialist magazines on the Prestel system, giving a what's on guide, film and book reviews and general comment for sci-fi fans. It's a very good read, but occasionally you find evidence of infrequent updating, with news a couple of months old. But it does genuinely replace the need to buy a sci-fi magazine on printed paper! Micronet 800 itself is still the most interesting source on Prestel for micro users, especially now that it is supplemented by things like Celebrity Chatline, giving the opportunity to talk 'live' to guests (often, but not always) from the micro world. Recent celebrities have included astrologer Tad Mann, an accountant, and the authors of the Elite game.



TELEX LINK Following the success of the Prestel Mailbox system, the telecom's facilities have been expanded to give every Prestel user with a keyboard the chance to send and receive telex messages, via Page 8. The text is edited like a normal Mailbox letter, then translated by the Prestel system into an outgoing telex. The rates for one message frame are: UK – 50p, Europe – £1.00, North America – £2.00, elsewhere – £3.00, maritime – £5.00, all excluding VAT. The cost is automatically added to your Prestel bill, but you do get feedback to your Mailbox about the progress of your telex. A new feature is that incoming telexes can now be forwarded to your own Mailbox number, provided that they have been correctly addressed.

Look what's coming

NEXT MONTH IN COMPUTING AGE

The sub £1000 PC

At least four IBM PC clones priced at less than £1000 were launched in Autumn. Simon Craven assesses the value of the PC standard for less money than an Atari 520ST, and compares the new machines with the real thing.

Ray tracing and Fractals

Ray Tracing has been an invaluable assistant to computer aided designers and graphic artists, and now fractal theory has produced a new landscaping geometry. Alan Pipes explains the principles and looks at the effects, plus a few examples to try at home.

Memory expansion

An in-depth look by a team of writers at the memory expansion possibilities of a range of computers, from the BBC and QL through to the Apricot F1E and Sanyo MBC series.

Using MS DOS

Mike James searches out those parts of MS DOS you thought you never had. A useful guide to the amateur and professional alike.

Atari Communications

The 520ST is the first home professional computer with a built-in terminal emulator. We assess its capabilities.

WIMPS on the Beeb

And its only 8-bits. Clive Williamson examines the wide range of AMX mouse driven software for the BBC micro.

ON SALE JANUARY 13th

Contents subject to late revision.

TANDATA TM602

The Tm602 modem supports auto dial and answer, and a wide range of communication standards, but Peter Luke wonders if the extra features are worth the expense.

When a basic, no frills modem costs less than £50, any model costing hundreds has to offer something special.

The Tandata Tm602 is just such a top-of-the-range model that offers, amongst an impressive array of features, the ability both to auto dial and answer. The modem also supports communications to a number of standards including V22 1200/1200 full duplex. Surprisingly in a modem of this price there is no provision for operation at 2400 baud – more on this later.

For the purposes of this review we used the Tm602 in conjunction with a BBC micro and Computer Concepts' Communicator software. We also took up Tandata's offer to supply a connection lead between the modem and the micro. We would recommend that anyone purchasing a modem (be it the Tm602 or any other make) also ensures that they are supplied with a suitable connection lead.

Unlike many of the cheaper modems on the market the rate at which data is exchanged between the modem and the computer is not tied to the speed at which the modem sends and receives data over the 'phone line. Irrespective of the communications mode selected, the Tm602 will communicate with the host micro at either 300/300 or 1200/1200 baud. This means that the Tm602 modem should be compatible with any RS232 serial interface as far as the hardware is concerned: the responsibility of handling the split baud rates of the V23 standard is the modem's, not the host computer's. (Many serial interfaces are not able to cope with operation at different baud rates for the transmission and reception of data).

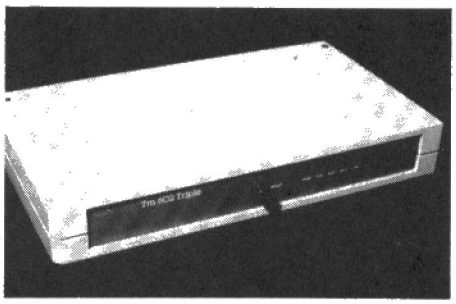
IN OPERATION

Some six pages of the comprehensive manual are devoted to connecting the power to the modem, plugging it into the 'phone system and hooking it up to the host computer in addition to a complete description of the RS232 port signal lines. But installing the Tm602 took a little under two minutes and, assuming our advice to get a ready made modem to computer lead is heeded, users shouldn't encounter any problems in this area.

When the modem is powered up it performs a self test, signalled by a rolling display on the front panel LEDs. If the self test is successful, after some three sends the yellow LED line indicator will pusle; all other indicators will be off.

The next step is to configure the terminal software for use with the modem. In the case of the Communicator software this involved toggling the screen echo flag and altering the default transmit baud rate speed from 75 to 1200 baud. Having set up the software it is necessary to signal the mode of operation to the Tm602. This is accomplished by typing asterisks (Dec 42) on the keyboard until these are echoed back to the display.

The auto dial facility is simply invoked by sending a stream of ASCII data of the form TELxxxxxxx, where xxxxxxx is the number to be dialled (alternative forms of this command are CTL BCRNxxxxxxxCTL C and, simply, Dxxxxxxx). **Table 1** lists the full set of commands associated with control of the modem's dialling. The Tm602 does not provide any means of storing telephone numbers and log on strings and in general the software used to drive the modem should support a means of sending command strings (macros) to the modem.



ON LINE

The Tm602 works with a number of e-mail systems including Telecom Gold and One-to-One. The modem came into its own when using such systems in the 1200/1200 mode. The sluggish response offered by 'Gold when operating at 1200/75 was dramatically improved and certainly made the service far more effective in operation. We had hoped to be able to try the system with a range of Prestel standard systems but unfortunately our Prestel terminal emulation software could not be persuaded to function with the Tm602. This was due to the fact that our software made no provision for the transmission of the command strings necessary to control the modem. This shortcoming was purely a function of the software used but does illustrate the need to select software that is easily able to send command macros to the modem.

The Tm602 has many other commands associated with the control of its auto answer facility and numerous other aspects of the units performance.

IN CONCLUSION

The Tm602 is a well built modem that offers a comprehensive range of facilities supporting operation at a number of different communications standards. It is however an expensive piece of equipment and many users will find it difficult to justify the price when much cheaper units can offer the bread and butter V23 standard which is supported by the majority of commercial e-mail services.

Many people might expect to see a 2400 baud capability in a modem of this price and while there are not too many applications for this format at present, it cannot be long before the attractions of operation at this speed are exploited. Another potential drawback of the modem is that the commands used to control its functions do not conform to the Hayes standard. An increasing number of comms packages are supporting the Hayes standard which could limit the appeal of the Tm602.

Tandata Tm602

Modes of operation

V23 originate
V23 half duplex
V23 answer mode
V21 originate or answer
V22 originate or answer
Auto answer and auto dial in all modes.

Front panel indicators

Power, line, Tx, Rx and CDT

Supplier Tandata Marketing Limited, Albert Road North, Malvern, Worcs. WR14 2TL
Telephone: 06845 68421
Price: £465.00 plus VAT

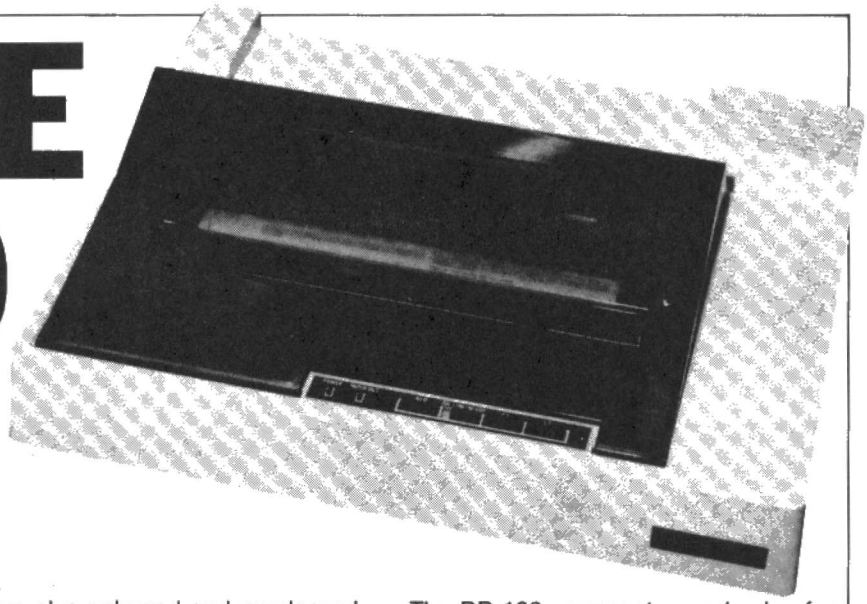
TABLE 1 DIAL CONTROL COMMANDS

TELxxxxxxx	
CTL BCRNxxxxxxxCTL C	dial number
Dxxxxxxx	
R or RPT	last number redial
i	force two second pause in dial string
,	wait until dial tone detected

TABLE 2 MODE SELECTION

V21	300/300 answer or originate
V22	1200/1200 answer or originate
23T	1200/75 answer mode
23C	75/1200 reverse answer mode

ADMATE DP-100



Nick Clare can find nothing wrong with an NLQ printer priced at under £200.

The days when microcomputer owners expected to pay well over £200 for a printer are long gone. Today for £200 or less a printer will be expected to offer a range of facilities which include an NLQ (near letter quality) typeface. The Admate DP-100 printer is typical of the low cost dot matrix printers now commonly available.

Initial impressions of the DP-100 were favourable but it must be said that the printer demonstrates evidence of cost cutting in some areas – these however in no way detract from the performance of the machine.

The front panel of the printer features two LED indicators, power on and paper out, and four push button controls that take care of the line feed and form functions plus on-line/off-line mode selection (the on-line state is signalled by an LED) and finally a control to select the NLQ type font. The other two controls are an on/off switch mounted on the right hand side of the printer and the manual paper feed knob to the left of the printer.

When we first used the printer it had a strange 'feel' to it. It took a little time to realise that it was the position of the manual paper advance knob that was responsible for this. On the majority of printers and, for that matter, electric typewriters, this control is on the right – nothing wrong with mounting it on the left, it just felt a bit strange to begin with.

'Epson-style escape codes means that most commercial software will be supplied with a suitable printer driver'

The printer is supplied with a Centronics interface as standard. It accepts either fanfold, single sheet or roll paper, with a self-stacking paper basket included in the price. The DP-100 supports a wide range of type styles; in addition to the NLQ mode these include normal (pica) and Elite characters plus enlarged and condensed printing. Super and sub scripts can be produced, and in addition an italic character set is available in most modes.

In addition to the 192 ASCII characters (96 normal, 96 italic) and the JIS characters the printer can also produce 103 semi-graphic symbols. The printer will also allow bit-image dumps to be produced with a resolution of 640 dots/line. Line spacing may be set in increments of 1/216", these are set by means of an escape code sequence.

In normal mode the print width is 80 columns and print speed is 120 cps.

In operation the printer performed well with no unexpected surprises. The model offers an impressive range of facilities at a very reasonable price. There are other printers available in the sub £200 price bracket but some make scrifices in terms of performance – the DP-100 cannot be faulted in this respect. The fact that printer operation is controlled via Epson-style escape codes means that the vast majority of commercial software will be supplied with a suitable printer driver.

The DP-100 represents good value for money in a fairly crowded market. By this time next year though there are likely to be a number of dot matrix printers that will outperform printers of the DP-100's specification and they will not cost much more either. But, of course, this statement can equally apply to most computer related products, and nobody can wait for ever.

'In normal mode the print width is 80 columns and print speed is 120 cps'

Admate DP-100

Price: £155 + VAT

Supplier: Cirkit, Park Lane, Broxbourne, Herts.

Telephone: 0992 444111

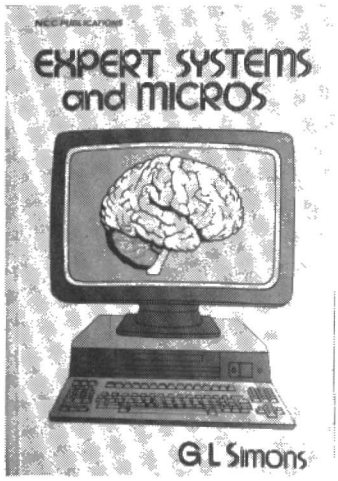
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ROM No. 1064NUA

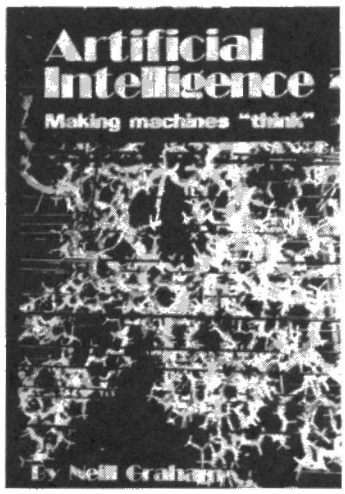
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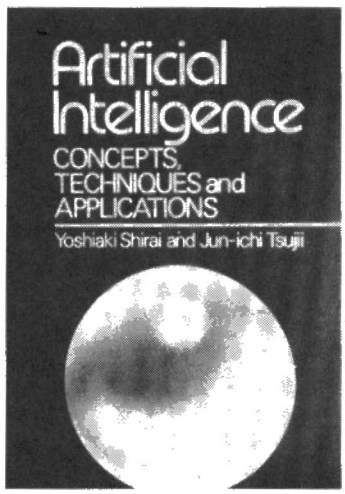
AI in print

If AI fails computing will never get beyond stock control and payroll management. Mike James reviews a selection of the many new books which reflect a growing interest in artificial intelligence.









Suddenly there are a great many books dealing with AI (Artificial Intelligence) at all levels. This is not surprising in that AI is still the great hope and hence interest of the computer community.

AI is seen as a way of making computers accessible to the 'ordinary person' and of extending the range of things that computers can do. On both counts AI promises to make money in an industry driven by profit.

The only trouble with introducing the profit motive into AI is that until recently it was the sole preserve of the academic who may have given a little thought to future applications but always felt safe that the future was a long way off!

To cope with the huge interest from an incredibly wide audience, publishers have not been slow to gather together and publicise collections of AI books. Some of these are academic text books, some are conference proceedings and some are non-technical works aimed at giving managers an idea of the current state of the subject and its possible commercial potential.

It is all too easy to adopt a cynical attitude to AI because of all the over-enthusiastic publicity but it has to be seen as the only future that computing has; if AI fails then computing will never get beyond stock control and payroll management.

The single most important boost that AI research in the US and the UK received was the announcement of the 'fifth generation computer project' in Japan. We have been beaten at our own game in so many high-tech fields that the attention given by Japan to AI couldn't be ignored.

The fact that much of the West's current enthusiasm for AI has been generated by Japan makes **The Fifth Generation Computer, the Japanese challenge** a very relevant book – and even more so when you know that its author is Japanese (Tohru Moto-oka) and the director of the entire project.

However, the book itself is very uninformative when it comes to the hardware and the software requirements of the project. All-in-all it adds very little to what we know of the way that the Japanese intend to realise their fifth generation ambitions, but it does give some insight into the Japanese way of doing things and what they'd like to achieve.

A book for the non-specialist computer user or manager.

Expert Systems and Micros by G L Simons is also a book aimed at the non-specialist and, as its title suggests is an attempt to explain the potential of expert systems running on micro computers.

AI is seen as a way of making computers, accessible to the 'ordinary person'.

In case you've missed all of the publicity that expert systems have been receiving it is worth saying that an expert system is a program that can draw conclusions on the basis of supplied evidence.

Most expert systems are involved in automatic diagnosis or fault-finding but they are capable of being used in many other roles. In the past few years expert systems have been heavily oversold and it is nearly impossible to achieve a balanced view on their usefulness.

However, if you would like to read a good factual account of their history, what people think of them, a little of how they work, what they are being used for and what they could be used for then I can recommend this book as an introduction.

The account is admirably well balanced and easy to read but I suspect that the author is still a little too pro-expert systems to place the proper emphasis on their limitations and theoretical problems.

A good book for the non-specialist computer user or manager and good background reading for the programmer.

As well as books dealing with specific AI topics there are also a great many books surveying the whole subject. The difficulty in writing such a book is finding some idea that links all of the sub-topics together. Authors either try very hard to find a unifying principle or give up and present AI as a series of fairly unconnected topics.

If you believe that there is a coherent theory of AI then the 'unconnected' books might leave you disappointed and confused, but I think that they are closer to the truth than the books that attempt to force a single organising principle on to the whole of AI.

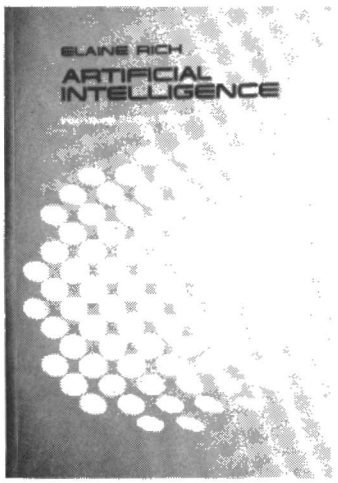
At the moment AI seems to need to draw upon a wide range of ideas and methods to implement individual aspects of intelligence and there are very few ideas that seem natural in more than one or two areas.

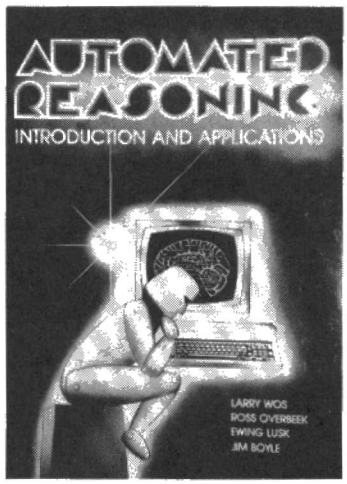
This is not to say that AI cannot be presented as a logical subject but there is no real justification for forcing a single interpretation. Indeed it is one of the interesting features of AI that almost anything can be described from a number of different points of view.

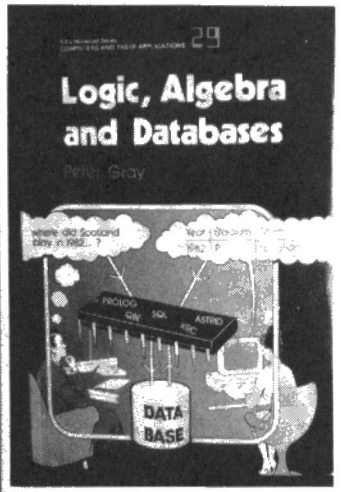
Artificial Intelligence, concepts, techniques and applications by Y Shirai and J Tsuji is a newly translated book that approaches AI mainly from the point of view of graph theory.

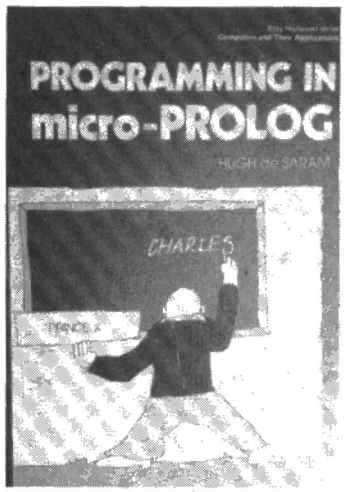
The book is structured in a way that doesn't reflect the usual division of AI into areas of application such as language and game playing but concentrates on general methods with examples from the various application areas.

For example a discussion of syntax appears in chapter seven dealing with the representation and use of know-









The books featured in this article should be available from leading book shops. In case of difficulty please contact our Book Service – address on page 42.

ledge. This is an interesting book with a refreshing approach and it is worth reading even if you already know something about AI.

My only criticism is that it is occasionally more technical that the subject requires.

If you are looking for a non-technical introduction to AI you could try **Artificial Intelligence: making machines 'think'** by N Graham. This is a lightning tour of AI in its widest sense, including robotics and machine perception. The book doesn't have a single theme running through it and so you can dip into it at any point and get an idea of what is going on. On the whole this is not a bad introduction to AI but it is now looking a little out of date.

My favourite general coverage AI book is **Artificial Intelligence** by E Rich. This is intended as an academic book, but don't be put off – it is very readable and complete. No particular theoretical approach is taken but the book succeeds in giving the impression that AI is a coherent subject.

By dividing the book into three parts, one dealing with problem solving, one with knowledge representation and

'AI was formerly the sole preserve of the academic. Now its driven by the profit motive'

one outlining how the ideas explained in the first two parts are used in the traditional AI applications, the author achieves natural logical structure.

This book is not for the complete beginner but otherwise I can recommend it to anyone wanting to know something about AI.

Automated Reasoning: introduction and applications by L Wos, R Overbeek, E Lusk and J Boyle is almost a general introduction to AI in the range of applications it describes, but it is actually about the use of logical reasoning to solve problems.

What is interesting about this book are the applications that are missing – no natural language understanding and nothing on machine perception. In many ways this is a book about how to use traditional logic and how to use a computer to automate the stages in theorem proving.

This is not to say that this is not an important topic and in future I would expect many AI products to be nothing more than implementations of the ideas of automated reasoning.

A good practical introduction to an important area of AI that is often neglected in books on general AI.

A very down-to-earth book on almost the same subject is **Logic, Algebra and Databases** by P Gray. Although dealing with the use of logical reasoning this book concentrates on the very real problem of retrieving information from large databases.

In principle, given any data stored on a computer, what we would like to do is to ask questions in a fairly natural language and have the computer do all of the work in finding out the answers.

In practice most databases don't live up to this requirement and you often have to write a program to find out exactly what you want to know.

The first part of the requirement is being solved by the development of programs that can understand English. The second half of the requirement, that of having the computer find out the answer to your question, is what this book is all about.

It is a well-written book dealing with some difficult material, not for the beginner but certainly important reading for anyone interested in AI or advanced database applications.

These days nearly all AI books include an introduction to Prolog and the two books on logic and reasoning reviewed above are more or less about Prolog applications.

Prolog is such an important language that it is pleasing to be able to recommend **Programming in micro-Prolog** by H de Saram. This book introduces Prolog and the principles that lie behind the workings of Prolog by way of examples.

The particular version of micro-Prolog used is for the Spectrum and while you can only get the most from the book by using it in conjunction with a machine running a similar version of Prolog there are enough illustrative printouts to give the flavour of using Prolog.

The book is divided into two sections – techniques which describe how to use Prolog and applications, which is a collection of projects implemented in Prolog including games, natural language translation and the inevitable expert system.

If you are a beginner interested in using Prolog then I can recommend this book to you.

'The fifth generation computer project gave AI its single biggest boost in the USA and UK'

BOOKS

The Fifth Generation Computer, the Japanese Challenge, T Motooka and M Kitsuregawa (1985), Wiley, ISBN 0 471 90739 1, £8.95.
Expert Systems and Micros, G L Simons, (1985), NCC Publications, ISBN 0 85012 506 5, £10.50.
Artificial Intelligence, Concepts, Techniques and Applications, Y Shirai and J Tsujii (1984), Wiley, ISBN 0 471 90581 X, £10.50.
Artificial Intelligence: making machines 'think', N Graham, (1979), TAB Books, ISBN 0 8306 1076 6, £9.50.
Artificial Intelligence, E Rich, (1983), McGraw-Hill, ISBN 0 07 052261 8, £10.95.
Automated Reasoning, Introduction and Applications, L Wos et al, (1984), Prentice Hall, ISBN 0 13 054446 9.
Logic, Algebra and Databases, P Gray, (1984), Ellis Horwood, ISBN 0 85312 803 0, £9.95.
Programming in micro-Prolog, H de Saram, (1985), Ellis Horwood, ISBN 0 85312 953 3, £7.50.

ELECTRONIC UNREALITY

Flight simulators are now so sophisticated that pilots can complete a conversion course without ever touching the new plane until 400 lives depend on it. Alan Pipes takes a flight of fancy.



Novaview SP1 night approach to Athens in Boeing 737 simulator (Rediffusion).

Computer simulation is, to put it simply, a cheap alternative to reality. Flight simulators and other training aids are also safer to use and their operation more tightly controlled than the real thing. There are compromises to be made, of course, and despite the falling prices of computer hardware and recent advances in software engineering, it is still true to say that the more real you want the simulation to be, the more it will cost to produce. This is especially true for simulations involving computer graphics, where the trade off is between being able to render realistic images and effectively orchestrating the sequence of events in real time.

Flight simulators today bear little resemblance to the first 'bucking bronco' trainers built in the 1920s by Ed Link in the basement of his father's New York organ and accordian factory. At least then they looked like planes, with their stubby wings and tail. Today's computer-controlled simulators are container truck boxes, featureless except perhaps for the airline's livery painted incongruously on the side, mounted up on six spidery hydraulic legs. But once inside, the trainee pilot can (almost) suspend belief as every subtle psychological trick is played to enhance the experience of reality. For outside on the instructor's console, some sadist is employed to throw every conceivable fault and unexpected hazard – from a van on the runway to the most intense and potentially lethal form of weather condition – a microburst – at the poor unsuspecting pilot.

Redifussion Simulation, formerly Redifon, is based in Crawley, Sussex and claims to have designed Europe's first fully electronic simulator in 1950 for BOAC's Boeing 377 Stratocruisers. It was built in Wandsworth and used an analogue computer, levers and springs to drive a frame running the whole length of the aircraft's fuselage. This was followed by another order, a simulator for the Comet I – the first jet transport simulator in the world.

Rediffusion now has over 300 simulators at major airlines and manufacturers (Boeing uses them for R & D), 200 of which are the night/dusk Novaview SP1 models. The company won't say how much they cost but industry sources say you must expect to pay $8-10 million. The day/night/dusk SP3 costs three times as much. And for the military market, where money is no obstacle, the CT5 with formation flying and weapons training starts at around $20 million.

Rediffusion has recently entered the entertainment industry with a 40-seat intergalactic ride at Toronto's CN Tower, said to be so authentic they have to provide sick bags. They have also teamed up with Smiths Industries and Solartron Simu-

lation on a £2.25 million Alvey-funded project to develop a knowledge-based instructor interface to reduce the workload and stressful conditions inherent in predicting a student's progress.

The company is developing more cost effective simulators for smaller aircraft and awaits the Civil Aviation Authority's proposals on clocking up training credits. Launch customer is Lufthansa, which has ordered two of these stripped down simulators for the twin turbo prop Piper Cheyenne IIIA. And John Vince, doyen of computer grapics – he developed the program Picaso at Middlesex Poly – will be heading a new research group to develop state-of-the-art systems for flight simulation.

RIDING A 767

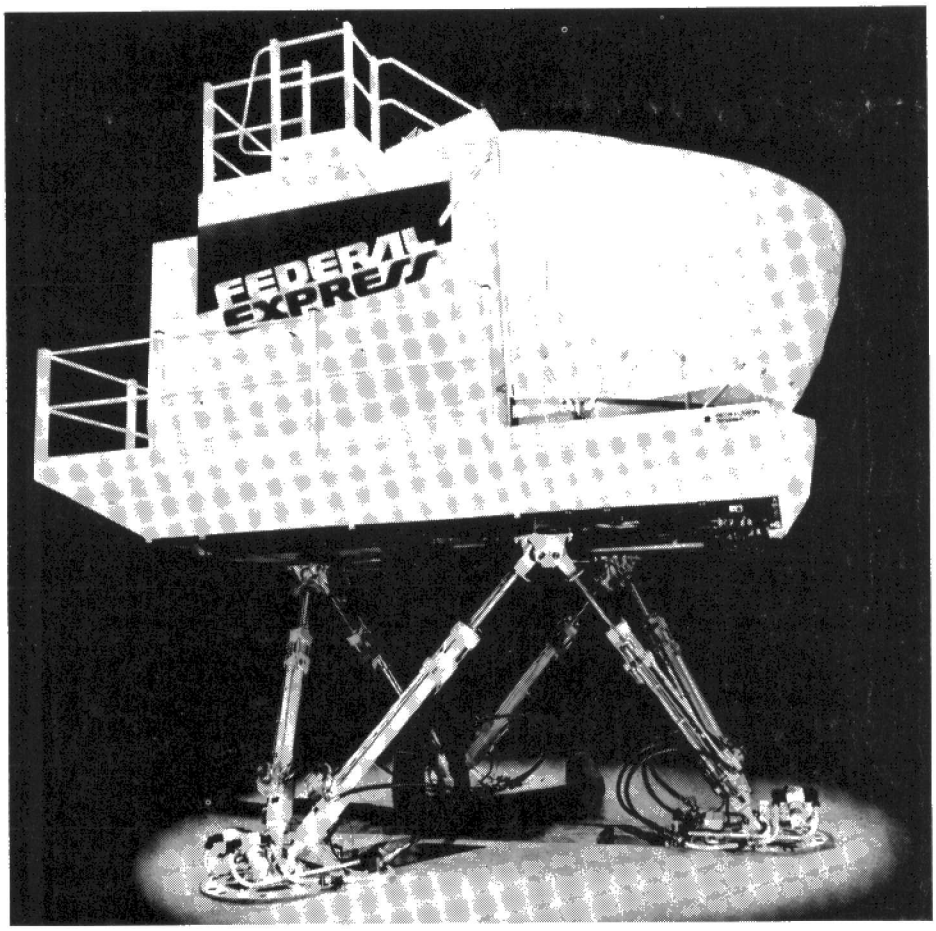
The main advantage of using a flight simulator is obvious – you cannot crash it. Airlines can also get started on 'converting' pilots to new types of aircraft before they take delivery of their fleet. They may be expensive – civil simulators cost around 10 per cent of the price of an actual plane – but running costs are lower, and the simulator can be kept on the go much longer – as much as 22 hours a day.

Simulators are apparently so good that the Federal Aviation Authority in the USA, the body that gives a simulator its 'ticket', allows pilots to convert from one type of plane to another, from say a Boeing 737 to a 747, without going anywhere near a real plane at all. The UK's Civil Aviation Authority is not so sure and still insists on the pilot's doing some real-life flying before being let loose on real paying passengers. But this is changing and Britannia Airways, which has Europe's first Boeing 767 simulator, now says a pilot needs only 45 minutes out of the 50 hour conversion course actually in the plane itself.

Britannia's 767 simulator was developed and built by Rediffusion Simulation. It can develop malfunctions and faults in more than 400 ways and emulate environmental conditions from daytime through dusk to night – with wind and lightning thrown in, all co-ordinated with vibration and sound.

The simulator is driven by two Gould superminicomputers – one for the dynamics and the other for the visual system – and contains a database of airports which include Gatwick, Manchester, Luton, Birmingham, Glasgow, Rome, Paris Orly, and a generic 'typical' airport.

The vision system, called WIDE (for wide-angle infinity display equipment), is another claimed first for Rediffusion giving uninterrupted viewing for 150 degrees horizontally by 40 degrees vertically. This is achieved by using three video projectors above the cockpit to shine an image onto a back projection screen which is viewed by the flight crew via a large Mylar collimating mirror which adjusts the image. A higher spec system is also available using five projectors to give a 200 degree field of view. The image generator is clever enough to conceal the joins and compensate for the spherical shape of the mirror.



Boeing 727 simulator (Rediffusion).

Before WIDE was invented, most simulators used six or so monitors placed directly where the windows of the cockpit would be, between the pillars – or indirectly via mirrors. The disadvantage of this was that the pilot's head movement was restricted. The new system compromises on brightness and the colour is somewhat suspect with a bias towards greens and yellows, but there is no limit to head movement. The crew can move around the cockpit freely and still see the view out of the window.

NIGHT FLYING

Luckily for the simulator makers, dusk/night simulators are now considered to be the best training tools. Lucky because daylight simulators – the ones that civil airlines can afford – are not yet very good, producing at best cartoon colours and boxy landscapes. For night flying all you really need are lights; and calligraphic displays are good at moving points of bright light dynamically. Rediffusion uses Evans and Sutherland displays, made in Salt Lake City, which have a long and distinguished reputation for the real time manipulation of 3D line and point images. Ivan Sutherland was one of the founding fathers of CAD-CAM with his 1968 PhD thesis at MIT on Sketchpad – a program for creating and editing images interactively. E & S displays are also used extensively in the exacting field of molecular modelling.

Most simulators use a hybrid combination of calligraphic type displays for the runway lights, say, and raster displays for the landscape. The problem with raster (TV-like) displays is that if the rasters run horizontally, the horizon may shimmer when the aircraft is banked, distracting the pilot; if the rasters run vertically, the viewer will have similar trouble with the sides of buildings.

Rediffusion's SP3 visual system was the first to be approved under Phase III of the US Federal Aviation Administration's Advanced Simulation Plan in which aircrew can carry out all initial, upgrade and recurrent training entirely in the simulator.

To win this 'ticket' the simulator has to generate scenes representing weather effects such as entering a thunderstorm on take off, approach and landing, and show features known to cause illusions – like when approaching an airport over water. SP3 can also simulate atmospheric conditions such as clouds, fog, horizon glow and lightning.

The latest technique added to the visual armoury overlays texture patterns onto 2D surfaces. Pattern detail makes clouds and water look more realistic and gives the pilot speed and height cues when the plane or helicopter is near the ground. Dynamic texturing can also simulate blowing sand

or snow.

The technique adds 10 per cent to the cost of a simulator – and takes up 10 per cent of the computing resources, but using texture algorithms relaxes the rationing on the number of edges and surfaces that can be portrayed in any one scene, so that expansion strips in runways, say, which before were modelled using edges, can now be produced by patterns – freeing a few more edges to be used to construct the more complex 3D shapes in the picture.

PROCESSOR POWER

Although simulator visual systems are not yet photographically real, they are at least



A dusk approach generated by Novaview SP1/T (Rediffusion).

co-ordinated. Co-ordination of the visuals with the dynamics of the simulator is essential so as not to cause distress or sickness in the person at the controls. The refresh delay must not exceed 50Hz.

Rediffusion uses Gould superminis runnig at six million instructions a second to power its simulators with high-performance interfaces passing 3.2 Mbits of information back and forth each second.

Rival Singer Link-Miles uses a different approach, and has designed its own distributed architecture. Each major activity of the simulator is broken down physically and functionally into separate CPUs, each controlling its own I/O. These are called Major Functions: there is one to work out the flight dynamic equations, one for the auxiliary flight performance functions, one for navigation/communications, one for the engines, one for the electrics/hydraulics systems, one for the digitally generated sound and one to drive the instructor's station. A standalone visual system is driven by the flight dynamics CPU. Each of these is a multiprocessor in its own right with six or so 16-bit Intel 80286 chips communicating with one another over Multibus. The 'major function' systems talk to each other over a proprietory bus in real time, using Ethernet for loading up from disk or collecting diagnostic data for later evaluation and analysis.

A complete system would typically contain six to eight CPU cards each with its own memory board, a card to drive the bus, an Ethernet card and half a dozen I/O cards to drive the instrumentation in the cockpit. So the CPU working out the navigational equations, for example, would also drive the I/O card working the appropriate instruments.

The major function CPUs are synchronised on a 'frame' basis. A clock, ticking away at 30Hz, sends a signal to the CPUs which work independently until the next tick when each piece of hardware broadcasts its latest values to all the others.

Singer Link-Miles is particularly proud of its digital sound generator which stores each element of, say, engine noise as a 'template' in digital form. Depending on the position of the throttles and hence how fast the engine is going, the template is modified to change the amplitude of the sound, so what the pilot hears always corresponds to the state of the aircraft.

The advantage of the distributed approach, says Singer Link-Miles, is that because it is modular the customer only pays for what is needed. There is a lower initial cost and a lower incremental cost. There is also more potential for upgrades, as the 32-bit 80386 chips come along. Plus there is less downtime as the simulator has cards dedicated to diagnostics – a mini would rely on any spare time left in each 30ms cycle to do as much as it could. Using the multiprocessor approach, engineers can look at the state of health of any processor, or the contents of any memory location, while real-time simulation is in progress.

Rediffusion has retaliated however with a deal with Gould that has produced their albeit 'offshore' distributed system SciClone/32. This is a collection of two or more Concept/32 superminis connected by what they term a reflective memory bus which overcomes the shared memory bottleneck by continually updating a portion of memory common to all the CPUs on the bus. The CPUs can work in parallel while always knowing what the others are up to. The bandwidth along the bus is 26.67 Mbytes/s, so that six million common 32-bit variables can be updated each second.

ILLUSIONS

As well as being able to act quickly, a simulator has to use lots of tricks to fool the user into thinking the machine is really moving. The six degrees of freedom allowed by the six hydraulic legs is enough to give the feeling of pitch, roll and yaw. But the system must also constantly 'wash out' imperceptibly back to its mid position ready for the next control deflection or response to turbulence, undercarriage or missile launch. The computer must simulate the forces the pilot feels on the pedals and joystick. An initial shove with hydraulic rams plus a tilt backwards can give the effect of g force – and this can be enhanced by a tightening of the seatbelt or, for the experienced pilot, a sudden gripping of the thighs. Daimler-Benz, which has developed a simulator for testing new cars, is working on a system that will sprint up and down the building on rails, to add a further dimension of movement.

All that is missing in present day simulators, according to Anthony Preston of Singer Link-Miles, is the fright factor. However willing or involuntary the suspension of disbelief, there is always a semblance of awareness that the simulator is not in fact the real thing: there is not the same feeling of responsibility for the lives of 400 or so human passengers behind the cabin door as there obviously is in a real plane.

And there is another danger, as pointed out by John Lewell in his book *Computer Graphics,* in substituting an artificial reality for reality itself. Television viewers may recall a 1981 BBC Horizon programme on computer graphics. It showed naval training exercises in which operators were taught to fire at computer images of ships. But how many viewers remember that the target being used was a representation of HMS Sheffield, a ship destroyed, from a remote and invisible plane, in the Falklands/Malviners war. It was a chilling reminder of the destructive power of technology and of the potential role that computer graphics may play in persuading simular trained people to unleash this power.

PRINTOUT

Each month *Computing Age* publishes utility, graphics, communications or business software for a range of home computers, including the BBC Micro, Sinclair QL, Amstrad, CBM64, Atari 520ST, CP/M and MS DOS machines.

This month we feature three programs for the Amstrad range of computers. The 'Function key editor' allows CPC 464 users to list and edit the function keys. 'Window designer' brings GEM like windows to all the Amstrad computers. The 'Intelligent Menu' program is also suitable for all machines and allows programs to be LOADed and RUN with a minimum of keystrokes.

The final program is for the QL and brings a new screen mode to the computer.

We want **you** to write for this column. If you have written software for any of the above machines then send it to *Computing Age*. We pay £75 per published page, as long as the listing meets the following requirements:

Listings should be set over a maximum width of 40 columns. Each listing should include an explanation of how the software operates, of between 200 and 400 words length. Your submission should be accompanied by a disk or cassette, and a clear printout of the listing. Please include a stamped self-addressed envelope so that the software can be returned if it is unsuitable for publication. *Computing Age* cannot accept responsibility for loss or damage to software submitted.

Send your software to: PRINTOUT, *Computing Age*, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU.

Function key editor

An Amstrad utility which enables the listing and editing of the function keys.

CPC 464

This program for the Amstrad CPC 464 allows the user to list and edit the contents of the function keys. It adds three system extensions to Basic, making it easier to call the routine at any time. Simply type the source code into your assembler, make sure that you assemble the code at 9000 hex. Once assembled, save it before calling it:

SAVE "KEYEDIT",B,&9000,&130

CALL &9000 initialises the new RSX commands. You now should have returned back to Basic. If not, re-check the source code.

To load the object code from cassette or disk:

MEMORY &8FFF : LOAD "KEYEDIT" : CALL &9000

The new commands are as follows:

IKEY — Lists contents of function keys (0-9)
ISKEY — Save current contents of keys to tape or disk
ILKEY — Load key data into function keys

Here is a brief run down of how the program works. The area of memory used to store the key data starts at &B446, but there are no end markers to signify that each key is complete. Instead, the first byte contains the length of data on that particular key and ends with either the next key number or &OD if chr$(13) was added on the end to make the key perform a carriage return.

The program recognises a carriage return if added, and adds it to the end of the key upon typing the command IKEY.

Please note that the program has been written to cater for only one carriage return per key. Also, once the program has been initialised by calling &9000, on no account call that address again (unless after typing KEY you get an 'unknown command' error message).

STEPHEN SKINNER

LISTING 1

```
 10              ORG   $9000
 20              LD    BC,RSX_TAB
 30              LD    HL,WORK
 40              JP    $BCD1
 50              RET
 60 RSX_TAB:
 70              DEFW  NAMTAB
 80              JP    START
 90              JP    LKEY
100              JP    SKEY
110 NAMTAB:
120              DEFM  "KE"
130              DEFB  $D9
140              DEFM  "LKE"
150              DEFB  $D9
160              DEFM  "SKE"
170              DEFB  $D9
180              DEFB  0
190 WORK:
200              DEFS  4
210 START:
220 KBUFF:       EQU   $B446
230 CHOUT:       EQU   $BB5A
240 MODE:        EQU   $BC0E
250 ROW:         EQU   $BB72
260              LD    A,2
270              CALL  MODE
280              LD    B,10
290              LD    HL,KBUFF
300              LD    A,1
310              LD    ($8FFF),A
320              LD    A,$30
330              LD    ($8FFE),A
340 LOOP1:
350              PUSH  BC
360              PUSH  HL
370              CALL  KNUM
380              POP   HL
390 LOOP2:
400              LD    B,(HL)
410              INC   HL
420 LOOP3:
430              LD    A,(HL)
440              CP    $0D
450              JP    Z,CR
460              CALL  CHOUT
470              INC   HL
480              DJNZ  LOOP3
490              LD    A,34
500              CALL  CHOUT
510 OVER:
520              PUSH  HL
530              LD    A,($8FFF)
540              INC   A
550              INC   A
560              LD    ($8FFF),A
570              CALL  ROW
580              LD    A,$0D
590              CALL  CHOUT
600              POP   HL
610              POP   BC
620              DJNZ  LOOP1
630              LD    B,40
640              LD    HL,TEXT1
650 LOOP4:
660              LD    A,(HL)
670              CALL  CHOUT
680              INC   HL
690              DJNZ  LOOP4
700              LD    A,($8FFF)
710              INC   A
720              CALL  ROW
```

```
730             CALL CHOUT
740             RET
750 LKEY:
760             LD   A,0
770             CALL $BC6B
780             LD   B,5
790             LD   HL,AFL
800             LD   DE,$8500
810             CALL $BC77
820             LD   HL,$B444
830             CALL $BC83
840             CALL $BC7A
850             RET
860 SKEY:
870             LD   A,0
880             CALL $BC6B
890             LD   B,5
900             LD   HL,AFL
910             LD   DE,$8500
920             CALL $BC8C
930             LD   HL,$B444
940             LD   DE,$89
950             LD   BC,0
960             LD   A,2
970             CALL $BC98
980             CALL $BC8F
990             RET
1000 KNUM:
1010            LD   HL,TEXT
1020            LD   B,4
1030 AGAIN:
1040            LD   A,(HL)
1050            CALL CHOUT
1060            INC  HL
1070            DJNZ AGAIN
1080            LD   A,($8FFE)
1090            CALL CHOUT
1100            INC  A
1110            LD   ($8FFE),A
1120            LD   A,44
1130            CALL CHOUT
1140            LD   A,34
1150            CALL CHOUT
1160            RET
1170 CR:
1180            PUSH HL
1190            LD   A,34
1200            CALL CHOUT
1210            LD   B,9
1220            LD   HL,CRKEY
1230 NCH:
1240            LD   A,(HL)
1250            CALL CHOUT
1260            INC  HL
1270            DJNZ NCH
1280            POP  HL
1290            POP  BC
1300            INC  HL
1310            JP   OVER
1320 TEXT:
1330            DEFM "KEY "
1340 TEXT1:
1350            DEFM "(Add"
1360            DEFM " 128"
1370            DEFM " to "
1380            DEFM "the "
1390            DEFM "key "
1400            DEFM "valu"
1410            DEFM "e wh"
1420            DEFM "en a"
1430            DEFM "lter"
1440            DEFM "ing)"
1450 AFL:
1460            DEFM "FKEY"
1470            DEFM "S"
1480            DEFB 0
1490 CRKEY:
1500            DEFM "+CHR"
1510            DEFM "$(13"
1520            DEFM ")"
1530            DEFB 0
```

Instant modes

A new screen mode on the QL, with 80 columns and eight modes, both at the same time. It's easier than you think.

QL

The author of this ingenious set of machine code extensions to SuperBasic has cracked the problem of getting 80 columns and eight colours on the same display. The extra commands MOD4 and MOD8 use interrupts to switch between modes so that both appear on screen simultaneously.

The delay between switching from one mode to another may be altered using the command MODON, and MODOFF will enable and disable this facility.

The machine code loader **(Listing 1)** should be typed in first. This will automatically create and save the machine code to mdv2_. The short boot program **(Listing 2)** shows how the code may be loaded and then runs the demonstration program **(Listing 3)**.

G. KENDALL

LISTING 1

```
100 REMark *** Computing Age ***
110 REMark *** Instant Modes ***
120 REMark  *** (c) G Kendall 1985 ***
130 DIM array(5):CLS:address=RESPR(250)
140 start=address:RESTORE
150 READ nwords
160 IF nwords<=0
170   PRINT "complete"
180   SBYTES mdv1_mod_cde,start,250
190   STOP
200 END IF
210 csum=0:FOR i=0 TO nwords-1:READ array(i):csum=
csum+array(i):NEXT i
220 READ csum2:IF csum<>csum2 THEN PRINT"Checksum
error":PRINT"Correct checksum",csum:PRINT"Line of
data":FOR i=0 TO nwords-1:PRINT,array(i);",";:NEXT
 i:STOP
230 FOR i=0 TO nwords-1:POKE_W address,array(i):ad
dress=address+2:NEXT i
240 GO TO 150
250 DATA 6,13432,272,17402,32,20114,19072,70324
260 DATA 6,26134,17402,162,16890,150,20712,81450
270 DATA 6,-1,8521,4,28700,20033,28672,85929
280 DATA 6,20085,5,84,1357,20292,20302,62125
290 DATA 6,80,1613,20292,20294,17920,32,60231
300 DATA 6,1613,20292,17477,19456,80,1101,60019
310 DATA 6,20292,14336,80,1101,20292,13312,69413
320 DATA 6,0,0,0,13432,274,20114,33820
330 DATA 6,26136,28913,3139,1,26128,12854,97171
340 DATA 6,-26624,17914,54,577,16383,13441,21745
350 DATA 6,28672,20085,24834,24718,16890,40,115239
360 DATA 6,18984,-1,26392,28701,20033,20968,115077
370 DATA 6,-1,24590,17402,18,20689,24582,87280
380 DATA 6,17402,10,20945,28672,20085,2000,89114
390 DATA 6,0,0,0,0,0,4654,4654
400 DATA 6,52,18987,6,26374,2241,3,47663
410 DATA 6,24580,2177,3,7489,52,5057,39358
420 DATA 6,1,-32669,12331,4,20936,-2,601
430 DATA 6,2113,3,7489,52,5057,1,14715
440 DATA 6,-32669,18990,51,26376,20974,51,33773
450 DATA 1,17963,17963
460 DATA 1,6,6
470 DATA 1,20085,20085
480 DATA 1,19998,19998
490 DATA 1,0,0
500 DATA -1
```

LISTING 2

```
100 ad=RESPR(250)
110 LBYTES mdv2_mod_cde,ad
120 CALL ad
130 LRUN mdv2_demo_bas
```

LISTING 3

```
100 REMark demonstration of NEWMODES
130 REMark save this as "mdv2_demo_bas"
150 REMark MODOFF turns the newmodes off
160 REMark MODON  turns the newmodes on
170 REMark MOD4 begins in MODE 4 Switches to MODE
8
180 REMark MOD8 begins in MODE 8 Switches to MODE
4
190 REMark MODDEL n  Sets the switch delay to n
200 REMark High values of n will slow the computer
210 REMark CTRL/F5 will flip between the modes
260 MODOFF
280 one
300 MODOFF
310 CLOSE#3
320 MODE 4
330 STOP
340 :
350 DEFine PROCedure one
360 MODE 8
370 OPEN#3,scr_512x256a0x0
380 PAPER#3,3:CLS#3
390 MODON
400 REMark MODE 4 - TURN IT ON - SET DELAY
410 MOD4
420 MODON
430 MODDEL 2200
440 FOR opic=0 TO 4
450 pic 80
460 pic 30
470 END FOR opic
480 END DEFine one
490 :
710 :
720 DEFine PROCedure pic(x)
730 FOR a=4 TO 160 STEP 8
740 INK#3,RND(255)
750 FILL#3,1
760 ELLIPSE#3,a,x,RND(24)
770 END FOR a
780 END DEFine
790 :
```

Window designer

A significant improvement on Locomotive Basic's windowing facility.

CPC 464/664/6128

The Amstrad has windows, so does the QL and so does the Atari 520ST – but there are windows and windows. If your preference is for windows which can be positioned anywhere on the screen and which can be of any size *and* which have shadow-borders à la GEM around them then this designer program will probably be of interest.

The program is in three sections. Most of the code is associated with window design and movement, and will not be needed when you have finalised the design and are ready to incorporate any window in a program of your own. The section from line 720 to 890 actually draws the finished window, and it uses some symbols defined in a third section of data at lines 910 to 1150. In fact only the SYMBOLS 252,253,254, 249 and 248 are needed for the window – the other data is used by the designer program. If you look at line 720 you will see that the window is defined by 6 variables. B is the window number, N.S.E. and W are the north, south, east and west edges of the window and P is the paper ink. If you load these variables with suitable values (which is what the designer part of the program does) then the command GOSUB 720 will draw a GEM-type window.

The designer part of the program has on-screen prompts and so needs no detailed explanation here. You can shrink a window, enlarge a window or move a window by pressing one of the S,E or M keys in conjunction with a cursor-arrow key. The window is displayed all the time and when the shape and position is to your liking, pressing <ENTER> or <RETURN> will give you the co-ordinates of the window so that it may be incorporated into your own program, with, of course, subroutine 720.

R. SARGENT

LISTING 1

```
100 REM AMSTRAD WINDOW DESIGNER
110 REM (c) R.SARGENT Sept 1985
120 :
130 MODE 1
140 REM READ PRESET WINDOW DATA
150 RESTORE 930
160 DIM Z(54)
170 FOR N=1 TO 53
180 READ S:Z(N)=S:NEXT
190 INK 0,Z(50):INK 1,Z(51):INK
2,Z(52):INK 3,Z(53)
200 BORDER Z(49)
210 GOSUB 1040
220 :
230 REM LOOP
240 :
250 WINDOW Z(3),Z(4),Z(5),Z(6):P
EN Z(2):PAPER Z(1):CLS
260 WINDOW £6,Z(39),Z(40),Z(41),
Z(42)
270 WINDOW £5,Z(33),Z(34),Z(35),
Z(36)
280 PAPER £5,Z(31):PEN £5,Z(32):
CLS £5
290 WINDOW £7,Z(45),Z(46),Z(47),
Z(48)
300 FOR B=1 TO 7
310 GOSUB 700:NEXT
320 FOR I=130 TO 255
330 PRINT £7,CHR$(I);:NEXT
340 PRINT £5:PRINT £5,"   PRESS
<ENTER>";
350 INPUT £5,X$
360 IF X$="C" THEN !COPY,1
370 :
380 MODE 1:CLS:PRINT:PRINT "   (
S)HRINK+ARROW    (E)NLARGE+ARROW
      (M)OVE+ARROW"
390 PRINT:PRINT "   PRESS <ENTER
> TO ACCEPT SIZE AND        POSI
TION"
400 PRINT:INPUT "   WINDOW NUMBE
R ";B
410 IF B<0 OR B>6 THEN GOTO 400
420 CLS:J=B*6+1:GOSUB 690
430 IF INKEY(8)=0 AND INKEY(60)=
0 THEN Z(J+2)=Z(J+2)+1:GOTO 570
440 IF INKEY(1)=0 AND INKEY(60)=
0 THEN Z(J+3)=Z(J+3)-1:GOTO 570
450 IF INKEY(0)=0 AND INKEY(60)=
0 THEN Z(J+4)=Z(J+4)+1:GOTO 570
460 IF INKEY(2)=0 AND INKEY(60)=
0 THEN Z(J+5)=Z(J+5)-1:GOTO 570
470 IF INKEY(8)=0 AND INKEY(58)=
0 THEN Z(J+2)=Z(J+2)-1:GOTO 570
480 IF INKEY(1)=0 AND INKEY(58)=
0 THEN Z(J+3)=Z(J+3)+1:GOTO 570
490 IF INKEY(0)=0 AND INKEY(58)=
0 THEN Z(J+4)=Z(J+4)-1:GOTO 570
500 IF INKEY(2)=0 AND INKEY(58)=
0 THEN Z(J+5)=Z(J+5)+1:GOTO 570
510 IF INKEY(8)=0 AND INKEY(38)=
0 THEN Z(J+2)=Z(J+2)-1:Z(J+3)=Z(
J+3)-1:GOTO 570
520 IF INKEY(1)=0 AND INKEY(38)=
0 THEN Z(J+2)=Z(J+2)+1:Z(J+3)=Z(
J+3)+1:GOTO 570
530 IF INKEY(2)=0 AND INKEY(38)=
0 THEN Z(J+4)=Z(J+4)+1:Z(J+5)=Z(
J+5)+1:GOTO 570
540 IF INKEY(0)=0 AND INKEY(38)=
0 THEN Z(J+4)=Z(J+4)-1:Z(J+5)=Z(
J+5)-1:GOTO 570
550 IF INKEY(18)=0 THEN GOTO 580
560 GOTO 430
570 CLS:GOSUB 690:GOTO 430
580 LOCATE 1,2:PRINT "WINDOW";Z(
J+2);",";Z(J+3);",";Z(J+4);",";Z
(J+5)
590 FOR I=1 TO 500:NEXT
600 PRINT:PRINT "DESIGN AGAIN (D
), VIEW (V), OR QUIT (Q)
610 INPUT X$
620 IF X$="D" OR X$="d" THEN GOT
O 380
630 IF X$="V" OR X$="v" THEN GOT
O 250
640 IF X$="Q" OR X$="q" THEN GOT
O 660
650 GOTO 610
660 KEY DEF 0,1:KEY DEF 1,1:KEY
DEF 2,1:KEY DEF 8,1:KEY DEF 60,1
:KEY DEF 58,1:KEY DEF 38,1:MODE
1:CLS:STOP
670 :
680 REM SUBROUTINES AND DATA
690 Z(45)=Z(J+2):Z(46)=Z(J+3):Z(
47)=Z(J+4):Z(48)=Z(J+5):B=7:GOSU
B 700:RETURN
700 Q=B*6+1
710 P=Z(Q):W=Z(Q+2):E=Z(Q+3):N=Z
(Q+4):S=Z(Q+5)
720 WINDOW £B,W,E,N,S:PEN £B,0:P
APER £B,P:CLS £B
730 LOCATE W,S+1:PRINT CHR$(248)
;
740 FOR P=W+1 TO E:PRINT CHR$(13
1);:NEXT
750 PRINT CHR$(129);
760 LOCATE E+1,N:PRINT CHR$(249)
;
770 FOR P=N+1 TO S
780 LOCATE E+1,P:PRINT CHR$(133)
;:NEXT
790 IF W<2 THEN GOTO 830
800 FOR P=N TO S
810 LOCATE W-1,P:PRINT CHR$(254)
;:NEXT
820 LOCATE W-1,S+1:PRINT " ";
830 IF N<2 THEN RETURN
840 LOCATE W,N-1
850 FOR P=W TO E:PRINT CHR$(253)
;:NEXT
860 PRINT " ";
870 IF W<2 THEN RETURN
880 LOCATE W-1,N-1:PRINT CHR$(25
2);
890 RETURN
900 :
910 REM WINDOW & COLOUR DATA
```

```
920 REM PAPER/PEN/W/E/N/S
930 DATA 2,1,1,40,1,25
940 DATA 2,0,2,13,3,15
950 DATA 2,0,11,22,5,17
960 DATA 2,0,19,38,7,19
970 DATA 2,0,28,39,9,21
980 DATA 2,0,6,35,4,22
990 DATA 2,0,9,32,7,19
1000 DATA 3,0,12,29,10,16
1010 DATA 13
1020 DATA 0,13,25,22
1030 REM SYMBOL DATA
1040 SYMBOL 244,0,1,127,127,0,3,
0,0
1050 SYMBOL 245,0,255,255,255,15
,255,15,255
1060 SYMBOL 247,15,127,0,0,0,0,0
,0
1070 SYMBOL 248,&FF,&7F,&3F,&1F,
0,0,0,0
1080 SYMBOL 249,&80,&C0,&E0,&F0,
&F0,&F0,&F0,&F0
1090 SYMBOL 250,24,56,127,255,12
7,56,24,0
1100 SYMBOL 251,15,31,254,252,25
4,31,15,0
1110 SYMBOL 252,0,0,0,0,0,0,0,1
1120 SYMBOL 253,0,0,0,0,0,0,0,&F
F
1130 SYMBOL 254,1,1,1,1,1,1,1,1
1140 KEY DEF 0,0:KEY DEF 1,0:KEY
 DEF 2,0:KEY DEF 8,0:KEY DEF 60,
0:KEY DEF 58,0:KEY DEF 38,0
1150 RETURN
1160 IF INKEY(8)=0 AND INKEY(60)
=0 THEN PRINT "S ARROW":STOP
1170 GOTO 1160
```

Intelligent menu

A simple program to CAT, LOAD, RUN or DELETE software on disk.

CPC 464/664/6128

This is a very simple and fairly short program for Amstrad CPC6128, CPC664 or CPC464 and DDI, which permits you to CAT a disk, select the program you want and Load, Run, or Delete it with the minimum of typing.

One of the more commonly used methods of providing a menu of programs to select from, is to create a menu program and insert the program names into it, so that selecting the number of the program that you want, causes it to be loaded. This is all very well for a disk in which the contents rarely change, but is a bit of a pain otherwise, as you have to keep adding new titles to it and re-saving it.

This program is in effect 'an Intelligent Menu' in that it doesn't matter what programs are on the disk. In fact you can load the program and then insert another disk if you wish.

What can be said about the operating of the program? Not a lot really, as it is competely prompted. All that is required is to type in RUN"D [ENTER], which will load the program and run it. You will then be presented with a CAT of the disk, in mode 2, with an arrow pointing to the first entry.

Use all four cursor keys to move the arrow to the title you want and press the ENTER key. A message will tell you the title you selected and request you to select from Load, Run, Delete or Cancel by entering the appropriate letter.

If you select Delete, you are warned and asked to confirm with Y. Any other key resets the arrow, for you to select again. Cancel will return you directly to the same position. Having selected to Load or Run, the program will be loaded or run, as appropriate.

The program should be typed in and saved with the title "D", this being the shortest possible name, to minimise typing in. A copy of this program should be kept on each disk, so that all that is required is to insert the disk and type 'RUN"D'.

The CPC664 and CPC6128 have some extra commands, one of which is COPYCHR$, which is used to read characters from the screen at the cursor position. The CPC464 does not have this command available to Basic, although there is such a routine available through machine code, so a short (11 byte) machine code routine is incorporated to take care of this.

Full details are given in REM statements in the listing, of the lines that can be omitted, or modified by CPC664 or 6128 users, if they wish, although the program works just as well using the machine code routine, it is just a little longer. Likewise, in line 320 the statement 'WHILE INKEY$ <>"":WEND' is used to clear the keyboard buffer before an input is required and this can be replaced by CLEAR INPUT.

To run through the program, line 50 sets up an error routine in line 340, which checks for ERR=200 and if so printing a message and then recommencing the program at line 110. Lines 60 and 70 set up the screen and a number of windows, as well as setting all variables to integer variables. Line 80 performs a CAT and then clears the four windows 1 to 4. These windows are positioned on the screen in such a way that clearing them erases the columns giving the size of the disk files, to make way for the arrow cursor. Line 90 jumps to the routine at the end, which sets up the short machine code routine to read the characters from the screen. Lines 100 to 230 position and move the cursor arrow around the screen.

Lines 240 to 270 locate the cursor and using either the machine code routine or COPYCHR$, read the program name from the screen. Line 290 checks the ninth character in the string, to see if it is a full stop (.). If it is not a full stop, either because the line was an empty one, or because it was one of the message lines, an error routine is set up using ERROR 200, which causes the program to jump to line 340.

Lines 300 and 310 print out the selected program's name and request you to select from the options provided. Line 320 checks for Delete and if so requests confirmation, while line 330 checks for Load or Run and if so, carries out the instruction. If neither of these are selected, the program is RUN again.

Line 340 is the Error routine and checks for ERR = 300 and if so, prints a message and then resumes. Otherwise the program just resumes.

Lines 370 to 420 are the routine that creates the machine code to read the characters and are unnecessary if you have a CPC664 or 6128.

DAVID FOSTER

LISTING 1

```
10 REM DISC Auto loader by David Foster.
20 REM
30 REM David Foster   (c) 1985
40 REM
50 ON ERROR GOTO 340
60 DEFINT a-z:INK 0,1:INK 1,26:BORDER 1:
MODE 2
70 WINDOW#1,14,17,4,20:WINDOW#2,34,37,4,
20:WINDOW#3,54,57,4,20:WINDOW#4,74,77,4,
20
80 CAT:CLS#1:CLS#2:CLS#3:CLS#4
90 GOSUB 370:REM omit this line for CPC6
64 and CPC6128
100 PRINT"Position cursor and press RETU
RN to select."
110 across=1:down=4
120 PRINT CHR$(22)CHR$(1)
130 WHILE INKEY(18)<>0
140 LOCATE across,down
150 PRINT SPC(14)CHR$(242);
160 WHILE INKEY$="":WEND
170 PEN 0:PRINT CHR$(8)CHR$(242):PEN 1
180 down=down+(INKEY(2))-(INKEY(0))
190 across=across+20*(INKEY(1))-20*(INKE
Y(8))
200 IF down<4 THEN down=4 ELSE IF down>1
9 THEN down=19
210 IF across<1 THEN across=1 ELSE IF ac
ross>61 THEN across=61
220 WEND
230 PRINT CHR$(22)CHR$(0)
240 A$="":FOR offset=0 TO 11:LOCATE acro
ss+offset,down
250 REM 'a$=a$+COPYCHR$(#0)' for CPC664
and CPC6128 instead of next line
260 CALL address,@char:a$=a$+CHR$(char):
REM for CPC464/DD1
270 NEXT
280 LOCATE 1,23
290 IF MID$(A$,9,1)<>CHR$(46)THEN ERROR
200
300 PRINT "You have selected      "a$
310 PRINT"LOAD, RUN, DELETE, or Cancel?
 L/R/D/C":WHILE INKEY$="":WEND
320 IF INKEY(61)=0 THEN PRINT CHR$(7)" C
ONFIRM DELETE  Y/N":WHILE INKEY$<>"":WEN
D:WHILE INKEY$="":WEND:IF INKEY(43)=0 TH
EN |ERA,A$:RUN
330 IF INKEY(36)=0 THEN LOAD a$ ELSE IF
INKEY(50)=0 THEN RUN a$ ELSE RUN
340 IF ERR=200 THEN PRINT" Invalid selec
tion":RESUME 110 ELSE RESUME
350 END
360 REM Lines from here to end not neces
sary for CPC664 and CPC6128
370 address=&900:char=0:FOR offset=0 TO
10
380 READ dat$
390 POKE address+offset, VAL("&"+dat$)
400 NEXT
410 DATA CD,60,BB,DD,6E,00,DD,66,01,77,C
9
420 RETURN
```

THE POLAROID PALETTE



Palette System with 35mm camera and Polarchrome 35mm Autoprocessor.

Getting hard copy from graphics software is a problem not solved by a printer or plotter – the screen output is always superior. Robin Mudge reviews a low cost solution to making the most of your artwork.

Interactive computer graphics is a field whose time has come. Until recently it was an esoteric speciality involving the use of extremely expensive hardware and idiosyncratic software. To produce the kind of graphics used on television is still expensive but a range of software is appearing that begins to make use of the ever improving graphics facilities offered by today's microcomputers.

Computer aided design software from Robocom; paintbox programmes like the AMX mouse and PCPaintbox; and more recently business graphics software from Dicomed and Digital Research and many others, are available for users of IBM PCs, Apples and BBCs. Whether it be the business user trying to translate the results of a spreadsheet for boardroom approval, or the creations of a graphic artist, or product designer, building up a computerised picture is a straightforward matter: but getting the image off the screen and onto a reproduceable media – 35mm film – may be a far more complicated and expensive proposition.

It is here that a new product from Polaroid, the instant picture people, comes into its own. Called the Palette, it is a desk top automatic RGB computergraphic camera system. Measuring only 20cm x 15cm x 35cm it's a cream box with a 35mm camera and an instant picture unit bolted to it. Together with its software that runs on the Apple IIe, Dec, IBM and BBC computers it takes all the hassle and guesswork out of pointing a camera at the screen in a darkened room. Speaking as a person who has to produce a lot of screen shots this device is a real godsend. Although photographing the screen can produce some good results, the problems of geometric distortion, estimating the correct exposure and poor colour renditions makes the process a hit and miss affair.

The Palette isn't entirely new. RGB computergraphic cameras have been around for some time but start at around £5000: the BBC version of the Palette is £845 – some difference? Before describing it in detail though, a brief pause to describe how RGB cameras work.

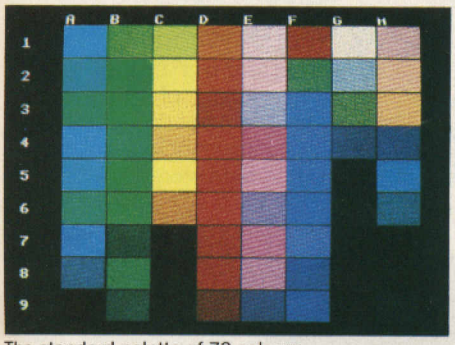
It all goes back to The Royal Institute of Great Britain and a British physicist, James Clerk Maxwell. In 1861 he proved that any colour could be synthesised by adding various amounts of red, green and blue light. He projected three black and white lantern slides, which had been photographed through red, green and blue filters, onto a screen. When the three images were in register, a colour picture was created. This is the basis of all modern colour film.

Each piece of film is in fact three black and white films, stuck together. Each layer is sensitive to one of the three primary colours, red, green and blue. How does all this relate to the computer graphic camera? Well, colour television produces a picture in the same way: look closely at the screen and you will see tiny dots glowing red, green or blue; when viewed at the correct distance they all merge together and produce colour pictures. The computer produces images in the same way, and shows them on a colour television tube. Each image contains red green and blue components which can be separated out under software control.

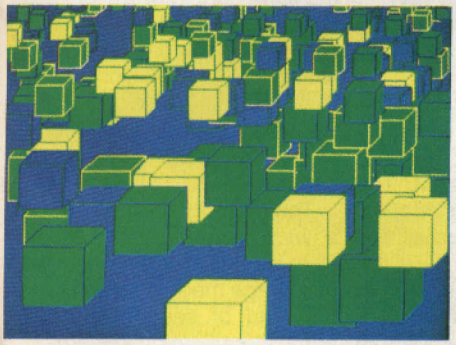
Inside all RGB computergraphics cameras is a small precision black and white television tube (CRT). Facing it is a camera and between the camera and CRT is a filter wheel containing red, green and blue filters. To expose a picture the sequence of events is as follows:

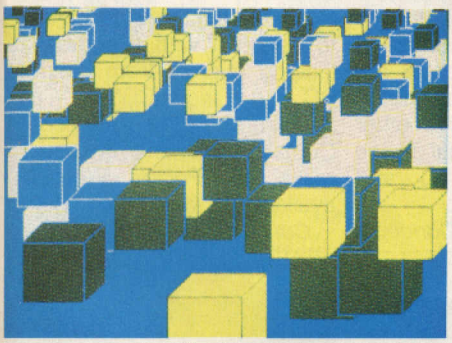
INNER WORKINGS

Firstly, one of the colour images is selected, separated out. This is done either by software in the computer (as in the Palette) or by hardware in the camera (more expensive units). Let's say it starts with the green picture; it then puts the green filter between the camera and the CRT; the camera shutter is opened and the CRT exposes the images for a predetermined period of time, onto the film, through the green filter. The CRT is turned off and the next filter brought into place, then the appropriate image separation is exposed onto the same bit of film, on top of the last image. When the final image has been exposed the camera shutter is closed and

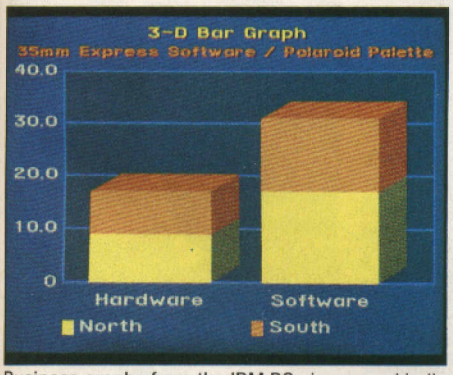


The standard palette of 72 colours.





Exposures made with the standard BBC micro colours and replaced by a selection of Palette colours.



Business graphs from the IBM PC give a good indication of the Palette's potential.

it is wound on ready for the next exposure. The system makes three separation exposures just like James Clerk Maxwell's three lantern slides back in 1861.

Although this method seems very simple it is extremely versatile and allows considerable improvements to be made to the computer generated image. Firstly the problem of correct colour rendition is completely removed. By adjusting the time for which each of the three exposures is made the colour can be balanced for any make or type of film. Secondly the jagged lines and circles common to relatively low resolution computer graphics systems can be disguised. During each of the separation exposures the image is moved very slightly, just enough to blur the edges. This has the effect of spreading them into each other and producing a lineless 'smooth' photograph. And thirdly the colours of the display can be altered themselves; this is the real power of the Palette.

The Palette comes complete with everything necessary to produce photographs. It has a motorised 35mm camera, a 3.25 x 4.25 instant print and transparency maker, a 35mm instant picture processor, a 35mm transparency mounter, connection cables, software, manual and samples of 35mm and 3.25 x 4.25 instant picture film.

Once the equipment is connected to the video and RS232 sockets, usage is very simple. The system is controlled by software running on the host computer and although its presentation is slightly different, depending on which computer you have, the facilities are all identical bar one, but more of that later. The newest software addition is the BBC version, so it is this that I will describe.

The software is entirely menu driven. It is started by pressing the shift and break key simultaneously (auto booting) and a list of default values for film type, exposure, Y and X flip, colour set, and motor drive option, is presented. The user can alter any of these, or go on to make an exposure. Choosing either option results in a hardware check, to see if the Palette is connected and switched on. If it is, then the software allows further options to be selected.

'The real magic of the Palette is its ability to produce any of 72 colours from screens generated by the 8 colour BBC micro'

Choosing to adjust the default values gives the 'SET UP' menu. The first thing to do is select the option that allows the Palette hardware to be adjusted. This is a once only affair which sets the geometry of the display CRT and its brightness level to achieve the correct exposure. Bypassing the 'SET UP' menu moves you directly on to expose pictures. The pictures must take the form of screen-dump images, on disk. They can be in any mode except mode 7. The software allows for single or dual drive systems and gives the opportunity to view the image before committing it to photographic record. The exposures can be made singly or in bulk. The bulk exposure mode allows nine image files to be selected including any combination of screen mode, drive and number of copies. Once set up the exposure is automatic. On the screen of the VDU the image is presented and then it is manipulated and separated into its three components. Bits magically appear and disappear in front of your very eyes as the Palette relentlessly makes each separation exposure.

Returning to the 'SET UP' menu allows all of the default settings to be altered. The films can be Polaroid 669 (3.25 x 4.25 instant print and a new transparency film), Polaroid 35mm instant slide film, Agfa, Fuji and Kodak Ektachrome 100 and a user defined film. The exposure can be lightened or darkened by a stop in 1/3rd stop intervals. The motor drive can be turned on or off and adjustment made to compensate for the mirror inside the instant print camera by flipping the image in the X and Y planes.

Three other options in this menu hold the key to the Palette's real magic. Remember that all colours can be made from various combinations of red, green and blue light. The Palette makes three separation exposures on each bit of film; now, if the relative exposures of red, green and blue were to alter, you would get a different colour. That's exactly what happens. The Palette comes with a choice of 72 different colours, the default values are set to those which match the computer's standard colour set of black, white, red, green, blue, cyan, magenta and yellow. The system will produce a picture containing the 72 colours arranged in a table. Each colour is identifiable with a row and column number. For each screen mode it is possible to redefine the default colours to any of the 72 by entering its reference number alongside each BBC colour to be changed. When the exposure is made instead of giving the exposure to produce say, red, it gives the exposures to produce salmon pink, or leaf green, or any of 70 others. If that's not enough; there's also a routine that lets you respecify the 72 colours themselves! But be careful, it's fun to do but working the colours out uses up a huge amount of film.

The only thing missing from the BBC version is the option that fills in the lines. But the price is £895.00 plus VAT, and whilst more expensive cameras can be plugged into any computer with an RGB output and, used with the right graphics processor, can produce high resolution pictures in millions of colours, at between £5000 and £20,000 each, you have to be very very serious about the quality of your slides.

In the meantime a BBC micro with a 72 colour palette is quite impressive enough.

Polaroid Palette

Price:	£895.00 plus VAT
Machines:	BBC micro Also IBM PC, DEC range, Apple II range (price on application)
Supplier:	Polaroid 0727 59191

Spy

Keeping a watch on the latest boxes of tricks to plug into your computer, plus all that's new in software.

Software Selection

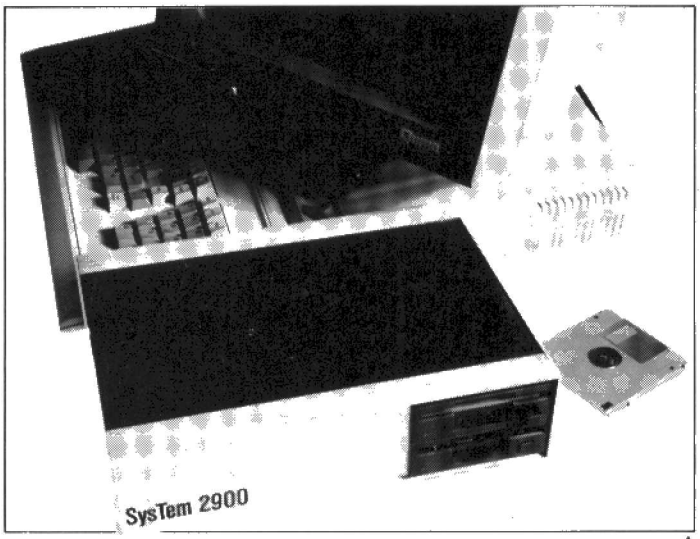
No shortage of new software for **Amstrad** users in the month that Pocket WordStar goes onto the Astron ROM card (see this page). The credit card sized ROM card connects into the I/O port, and will shortly be available for other CP/M computers. Early in 1986 there are plans to put the smaller WordStar onto a new high speed ROM card with up to 1 Mbyte of memory. Of still more interest, Caxton has translated many of its popular MS DOS business packages into CP/M for the **Amstrad CPC6128** and **PCW8256.** Brainstorm, the thought processor, is priced down from £195 to £50, and Touch 'n' Go, the typing tutor, from £55 to £25. The SmartKey keyboard supercharger is also available in CP/M. Pace Micro Technology has released a comms package for the complete Amstrad range to communicate with both viewdata and terminal services. The software was developed around the successful BBC Commstar package and retains many of its features, and is bundled with the Nightingale multi baud rate modem. The combination comes with serial interface/ROM board and software on a 16K EPROM, and is priced at £150.

Pace has also released a comms pack for the **Electron,** in association with manufacturers Acorn. Also an EPROM bundled with the Nightingale, it allows access to Prestel and of course Gold. The bundled I/O board is manufactured by Acorn. Price for all three products is a competitive £100. Pace 0274 488211.

Acornsoft is due to announce three new releases before Christmas for the **BBC micro** including new tracks for the racing game Revs, a new version of the View wordprocessor, and, at last, MicroProlog.

A graphics package worthy of

Continued opposite



OS9/FLEX MICRO

Micro Concepts has introduced a £795 6809 based system designated the System 2900, aimed at users who require a full feature universal development system at a reasonable cost.

The system supports either the OS9 Level One or FLEX operating systems – both are supported by firmware supplied with the machine.

The 64K of RAM supplied with the basic machine can be expanded to 1Mb in addition to a further 32K of EPROM. The system is supplied with twin 3.5" 80 track drives – a further two drives may be added.

System 2900 provides two parallel I/O ports capable of driving a Centronics compatible printer, EPROM emulator or other parallel controlled devices. Two serial ports are also provided, one designated as a console port, the other available to drive a serial device operating between 50 and 38400 baud.

Contact Micro Concepts 0242 510525.

POWER BBC

With the wealth of add-ons available for the BBC micro it is all too easy to overload the micro's own internal power supply. Pace Micro Technology is now able to offer a solution to this problem in the form of a stand-alone PSU providing four BBC compatible power outlets. Priced at £39 plus VAT the unit is available from Micro dealers or from Pace direct.

Contact Micro Technology 0274 488211.

TEMP PROBE

A temperature probe designed for use with the BBC micro is now available from Capital Delta. The probe covers the temperature range –40°C to 110°C and plugs into the computer's analogue port. The probe uses simple Basic statements and is supplied with sample program listings and full instructions. It costs £11.99 plus VAT.

Contact Capital Delta at Unit 1, 8 Dunlin Close, Pynton, Cheshire SK12 1JS.

SANYO CUT

Sanyo continues to maintain its interest in the low cost end of the micro market. They are the latest company to make educational establishments an offer that is difficult to refuse.

For an 'all-in' price of £699 (excluding VAT) they have launched a schools package that consists of an MBC555 micro, a hi-res green screen monitor, the CRT36, and a selection of software that includes Wordstar, Spellstar and Calcstar. Sanyo see the system as being of particular interest to higher education establishments who could use the equipment to form the basis of many business-related courses.

The latest from Sanyo is the MBC885 with 'total IBM compatibility'. Operating under MS DOS 2.11 the MBC885 features 256K of RAM, expandable to 640K. Twin 360K drives are built into the computer which also provides seven expansion slots accepting standard IBM cards.

Contact Watford 46363

CUMANA CARD

An agreement between Astar International of Tokyo and Guildford based Cumana has lead to the launch of a new concept in data storage. The Stron IC card is a solid state memory device that has the appearance of a normal credit card. Built into the card is a solid state memory device which can be one of four different types – mask ROM, EPROM, EEPROM or high speed read/write CMOS RAM powered by a lithium battery with a five year life. Connections to the card's memory are made via an edge connector running along the lower edge of the card.

The memory card is suited to a wide range of applications, from replacing traditional forms of storage media to new uses in the field of security and personal identification systems.

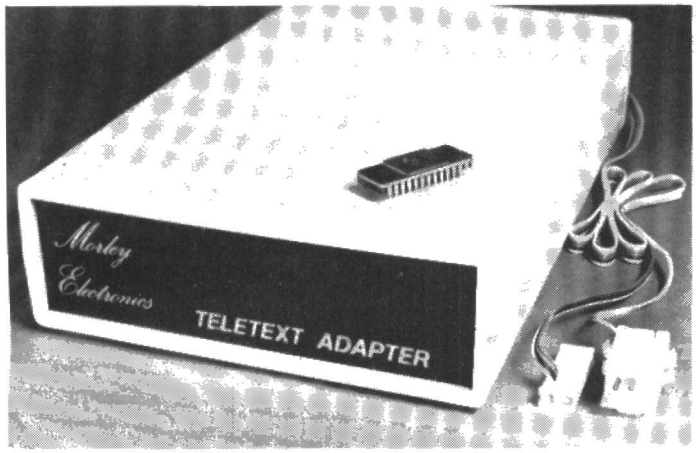
An adaptor allowing the card to be used with a number of leading micros, from the IBM PC to the CBM64 and Spectrum, can be supplied by Cumana. Cumana is also to make its 'Pocket Wordstar' available on the Astron card.

Contact Cumana 0483 503121.



BIGGER SPLASH

If you've ever had the desire to wash your computer down with a high pressure hose you'd better make sure that its the GERCOM/80IP65 terminal. Of course the computer is not meant for use in the home but in industries such as food processing where the ability to operate in a wet environment is an essential part of the spec.



TELETEXT ADAPTOR

Morley Electronics is now able to offer teletext adaptors designed for operation with the Electron and Commodore 64/128. The Electron version creates a simulated mode 7 environment and has an RGB output provided as standard, although a UHF modulator is available as an optional extra. The Commodore version plugs into the computer's user expansion port and provides software that generates a simulated teletext display.

Both units should be available now. The Electron version costing £150, the Commodore design is some £20 cheaper.

Morley is also able to supply a 1Mb RAM disk for the BBC micro. The company stresses that this is not another sideways RAM system but a true silicon disk that plugs into the BBC's 1MHz bus.

Contact Morley Electronics 091 251 3883.

COMPUTER ALARM

Computer equipment comes a close second to video recorders in its attractiveness to the thief. With one burglary taking place every 60 seconds it makes sense to take steps to protect your computer and peripherals from those that would covet your goods. Two new devices, the Spider and the Fly, allow valuable items of equipment to be protected at quite reasonable cost.

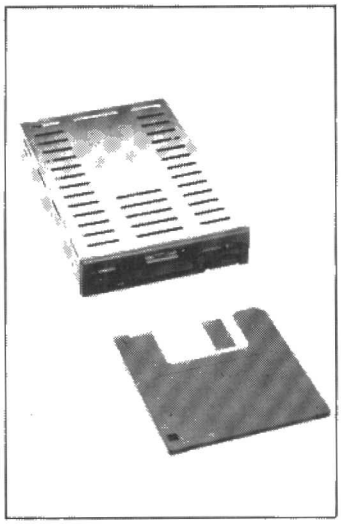
While both products are described as new concepts, devices similar in operation to the Spider have been in use in shops for some years now. The central unit cosists of a small box in which is mounted a 98dB high pitch repeating hooter. The alarm is triggered if the circuit formed by any of up to four tentacles (formed from four-core wire) is broken. The tentacles are 'threaded' through the equipment to be protected such that any would be tea leaf is forced to break the connection in order to walk off with any equipment.

The Fly operates in a different fashion in that it is physically attached to the equipment to be protected. A movement detector within the unit will trigger the alarm if the protected item is moved.

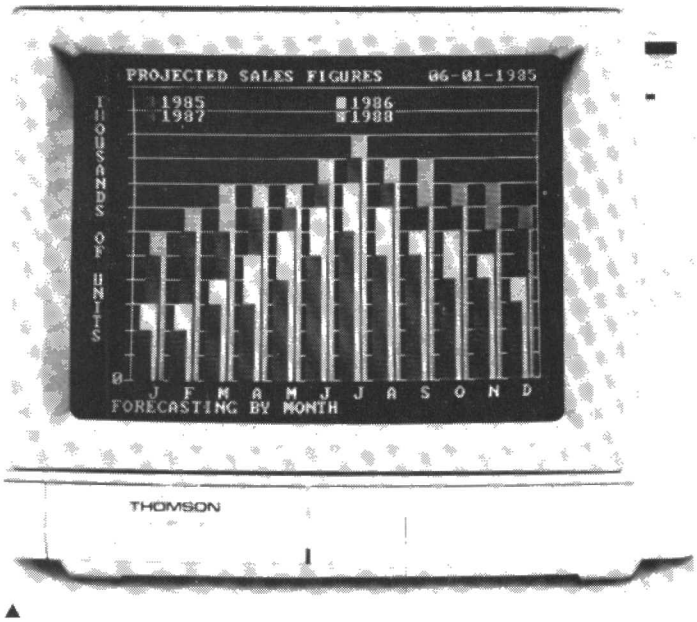
Both devices are activated by a high security lock with 2,000 combinations. The Spider's alarm will sound for a period of 150 minutes once activated – the Fly's alarm will continue for the same period during movement but will reset after five seconds when still.

The recommended price of the Spider is £34.95, the cost of the Fly is £24.95.

Contact Product Innovation 01 580 7636.



Left, Epsons SMD numeric Z80 microfloppy drive is the slimmest in the world. ▶



▲

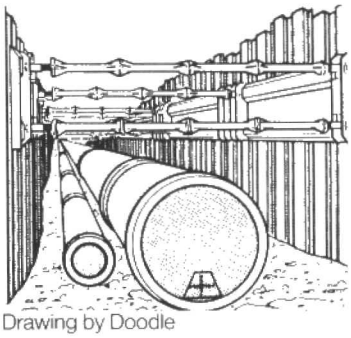
MONITORS

A range of eight colour and monochrome monitors for home and business systems was recently launched by Thomson.

The monitors range in price from £85 to £649.

The range offers a wide degree of compatibility with leading PC's including IBM, Apple, Atari, Commodore, ACT-Apricot and Amstrad.

Pictured is one of the monitors, the CM31311S1, this is a high resolution, RGB colour monitor that features a 12" non-glare tinted screen and a .31mm dot pitch tube.



Drawing by Doodle

Software continued

attention is Doodle, by the Trilex software company. Doodle is an MS DOS all-purpose drawing, design and electronic design package now available on the **Apricot F1** and of course **IBM PCs and compatibles.** Using Doodle it is posssible to create hard copy drawings up to 2m x 3m size; drawings can be integrated with wordprocessed text; the package includes arc, zoom, and a system for layering sections of a drawing one on top of the other after they have been drawn separately.

CP/M users who want to convert to **PC-DOS or MS DOS,** and take their software wtih them, will jump at a new package called CPEmulator, marketed in the UK by Bytron (0652 688626). Bytron claims a 100% success rate for the product, but if you think this is the answer to your dreams, remember, it costs £199 plus VAT.

The world having gone Halley's comet crazy this must be a good time for Talent to launch Cosmos, which displays 'accurate star maps for any date and time, past, present or future' on the **Sinclair QL.** On the **Spectrum** meanwhile you can see one of the best animated introductory screens yet devised, on the game 'I of the Mask' from Electric Dreams Software. Iso on the Spectrum is a data encryption program, capable of scrambling and unscrambling Tasword files. It's from Ciphersoft.

So, how many of the many **Atari 520ST** packages promised have surfaced? Few applications packages off the line so far, but plenty of utilities. GST (0954 81991) has three products: C, ASM, and EDIT. Respectively, C compiler, 68000 macro assembler and GEM screen editor. From Hisoft (0582 696421) there is, of course, DevpacST, the ST verison of its well-kwown editor, monitor and assembler. BOS (01 831 8811) is busy translating its business packages to the ST – priced in hundreds of pounds, not tens. Talent's West and Zkull are now available; so is Desk Diary by Eidersoft, Kuma's spreadsheet package, and STAccounts by Silicon Chip Ltd (0753 70639).

EXIT

Common sense goes out to lunch

Simon Craven has some dire warnings for PC users, dealers, and manufacturers

With twenty-twenty hindsight, the collapse of the home computer market was as inevitable as the wheels falling off the skateboard craze or CB radio running out of airwaves. An industry that experiences sudden, irrational growth in sales of products used primarily for entertainment has to regard gratefully every week the money keeps rolling in as a week during which the rule of common sense is temporarily out to lunch.

Few people consider the business micro market as volatile as the sadly withered home computer scene. Two elements contribute to this outlook: the presence of IBM, and the perceived stability of the *need* for business computing. No-one needs a home computer: it is bought to feed a consuming hobby by a few users, but now that the hubbub over computer games has died down, the majority of micros in people's houses lie idle. A business micro, on the other hand, is not bought to satisfy curiosity or whim. It is bought for sound, mature, boring reasons like cost-effectiveness and improved productivity – reasons which do not fluctuate with fashion.

'There is little evidence to suggest that halving the cost of IBM compatible computing will result in sales doubling'

Demand for business micros (which largely means IBM PC clones of various types) should therefore be steady and predictable, and the industry should settle down into a conservative maturity, aided by the *de facto* standards on specification and pricing set by the world's most influential organisation, IBM.

Unfortunately for those involved in the business of shifting business micros, these civilising influences do not look like saving the whole industry – manufacturers to retailers – from a rude kick in the ribs.

Paradoxically, the problem lies in reducing costs. Recent sightings in the US reveal an impending influx of cheap IBM PC clones – and in this case, cheap means from around £500 for a monochrome display, floppy disk system; or about £900 for a 10MB hard disk machine emulating the IBM PC XT.

Adam Osborne, to name just one entrepreneur, has signed up a deal to bring these machines into the UK, in parallel with his campaign to undercut traditional application software prices with Paperback Software.

Already the prices charged for the more traditional IBM PC clones are falling rapidly as a result of the tremendous competition between dealer chains. Even IBM equipment is widely discounted: if you want to pick up a twin-floppy PC Portable, Morse will be happy to sell you one at £995. Further up-market among the 'quality' compatibles, Olivetti M24s with 640K of RAM and 20Mb hard disks have been seen at around £2300. The 256K twin floppy system with its superb monochrome monitor can be had for as little as £1300.

This sounds like wonderful news for users, and especially to knowledgeable enthusiasts like most *Computing Age* readers. However, those who were not brought up on hand-built Z80 machines or DIY Acorn Atoms will suffer.

It is not hard to see that, when the Taiwanese machines seen at the recent West Coast Faire appear in this country in force, the price war can be expected to wipe out any semblance of an orderly market. Once users realise that the going rate for a fully functional IBM PC-like computer has roughly halved, very few will be sold at anything like the prices the dealers and manufacturers have been able to command over the last year or two.

Unfortunately for everyone concerned there is little evidence to suggest that halving the cost of IBM compatible computing will result in sales doubling. If demand was firm, then IBM would not yet be allowing the discounting which has crept in over the last six months. So any dealer shipping roughly the same number of units at a vastly reduced margin will not be able to afford to give any meaningful after-sales support. Nor can the reduced profitability be expected to reduce the already high rate of insolvency amongst dealers, so the buyer of a cheap PC might find himself on his own sooner than he would wish.

Manufacturers' warranties cannot be relied upon to sort out the machine if it goes wrong. If you buy an Olivetti M24 it is reasonable to expect Olivetti to stand behind it if it blows up on the second day of use. However, many of the cheap deals now on offer do not qualify for full manufacturers' warranties. Frequently dealers buy in very basic, low-cost configurations such as 128K single-drive models from the brand-name manufacturer, and add their own, independently sourced, floppy or hard disk drives, and add-on memory boards. If your machine is one of these you will find it very difficult to get warranty claims taken seriously: the computer manufacturer will blame the hard disk, the disk manufacturer will blame the memory board, and the memory supplier will complain about the person who assembled the configuration in the first place.

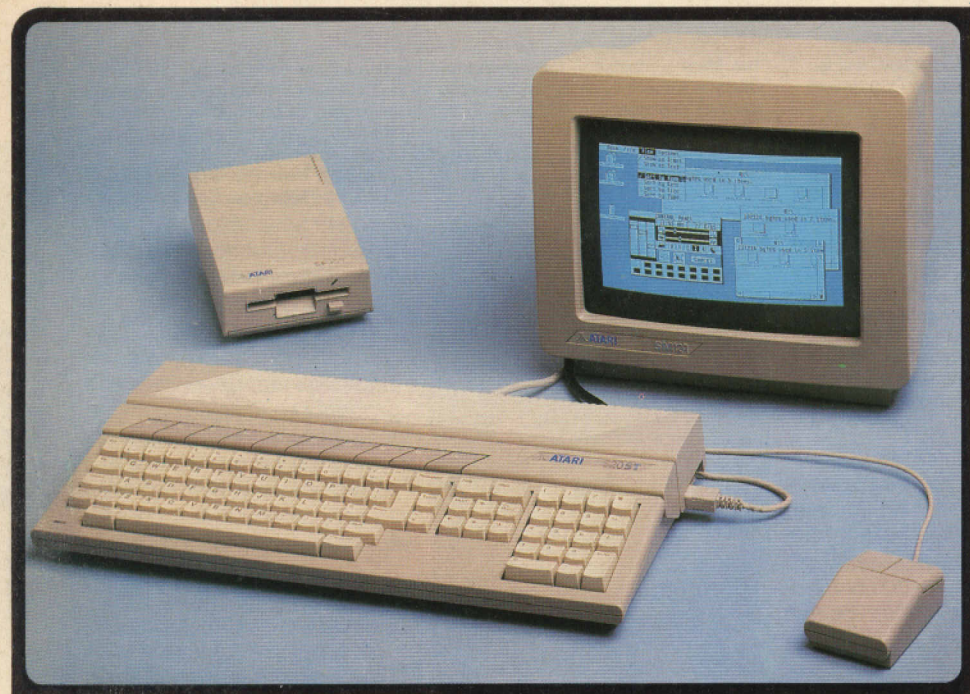
If the fault is more subtle, such as being unable to make the serial port talk to a modem, or getting the printer to work properly, you can forget about assistance altogether.

This potential state of affairs is all too plausible, but it is clearly unacceptable for the majority of people who buy serious personal computers. One possible development in the short term is that the definitions of manufacturer and dealer support will be much more accurately defined, and sold to the user as optional extra packages, in much the same way as maintenance contracts. Until recently you have been obliged to pay for 'dealer support' whether you liked it or not, and what you got in return for the dealer's fat margin was mainly a set of vague assurances, with no proper agreement of what was and wasn't included. If it becomes accepted practice to sell dealer support as a visible item, the user will get a much better idea of what he is paying for, and competition between dealers will improve standards.

Another possibility is that computers will be sold much more as complete packages. Alan Sugar faced a similar problem when he wanted to produce low-cost audio systems – if the equipment was relatively unprofitable for the dealer, it would have to require the minimum of setting-up and maintenance, and include everything the customer needed to get it working by himself. The answer in that case was 'stack' hi-fi. With all the components coming from the same source, and built into an integral unit, there were not connection or compatibility problems. The same approach has worked to dramatic effect in computers. A dealer selling a CPC6128 or PCW8256 knows that all the components – computer, disk drives, monitor, printer – will work together first time and his chances of seeing an unhappy customer walk back through the door at the end of the week are low. The 8256 word processor takes the process one step further.

'Paradoxically, the problem lies in costs . . . an impending influx of cheap IBM PC clones from around £500'

The Amstrad computers just plug in and go. If more manufacturers end up adopting a similar attitude to the users of their systems, maybe some good will come out of the forthcoming shakeup in the personal computer industry.



ATARI ST

520ST

POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3½ inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizeable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below: 1) TOS -Tramiel Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3½ inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 + £97.70 VAT = £749.00 This price includes:

- ★512K RAM
- ★B/W MONITOR
- ★MOUSE
- ★500K 3.5" DISK DRIVE
- ★GEM
- ★KEYBOARD (95 KEYS)

£749

ATARI 520ST SPECIFICATION

MEMORY
512K RAM (524,288 bytes)
16K ROM expandable to 320K
Port for addnl 128K plug-in ROM cartridges
200K TOS operating system

GRAPHICS
Individually addressable 32K bit-mapped screen with 3 screen graphics modes:
320x200 pixels in 16 colours (low resolution)
640x200 pixels in 4 colours (med resolution)
640x400 pixels in monochrome (high res)
16 shades of grey in low res mode
512 colours available in low/medium res
8 levels of each in red, green and blue

ARCHITECTURE
4 custom designed chips:
GLUE Chip - MMU Memory Mngmnt Unit
DMA Controller - Graphics Processing Unit
16/32 bit Motorola 68000 processor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
16 bit data bus/24 bit address bus
7 levels of interrupts/56 instructions
14 addressing modes/5 data types

DATA STORAGE
High speed hard disk interface
Direct memory access 1.33 Mbytes per second
CD (Compact Disc) interface
Built in cartridge access
Dedicated floppy disk controller

DISK DRIVE
500K (unformatted) s/sided 3½" floppy d/drive
349K (formatted) storage capacity

SOUND AND MUSIC
Sound Generator
Frequency control from 30Hz to above audible
3 voices (channels) in wave shaping sound in addition to a noise generator
Separate frequency and volume controls
Dynamic envelope controls
ADSR (Attack, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD
Separate keyboard microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
95 keys including 10 function keys
Numeric keypad — 18 keys including ENTER
One touch cursor control keypad

MONITOR
12" screen - high res monochrome monitor
640x400 monochrome resolution

Note: Some of the above specifications are pre-release and may therefore be subject to change

VIDEO PORTS
Display - Low Resolution - 40 columns
Med/High Res - 40/80 plus cols
Medium res RGB (Red/Green/Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum Baud Rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menus
Two button mouse controller
Icons/Pull down menus/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM BBT - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment
with user friendly Macintosh style operation
'TOS' - Tramiel Operating System
Atari's own system based on CP/M 68K with hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
'BOS' - Business Operating System
to run any standard BOS business programs
GEM desktop
with GEM PAINT graphics mgmt system and GEM WRITE word processor
Personal BASIC and DR Logo
originally written by Digital Research (DR) Very much like those on other machines except for the extensive use of pull down menus, mouse control and windows

VARIOUS
Dimensions: 470mmx240mmx60mm
Replaceable external power supplies
Expansion: 3½" floppy disk drives 500K/1,000K (two drives can be connected)
3½" 15Mb hard disk
CD (compact laser disc)
Dot matrix & d/wheel prntrs (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES
BASIC & LOGO supplied
Many others will soon be available, including: Assembler, BCPL, C, Cobol, Compiled Basic Lisp, Modula-2 and Pascal

MACINTOSH v F1e v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, cursor and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third of the price."
June 1985 - Jack Schofield - **PRACTICAL COMPUTING**

FEATURES OF BASIC SYSTEM	APPLE MACINTOSH	APRICOT F1e	ATARI 520ST
Price Includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x28	470x240x60
Keyboard size ins (LxDxH)	13x5¾x2	17½x6½x1	18½x9½x2½
3½" D/Drive (Unformatted)	500K	500K	500K
3½" D/Drive (Formatted)	399K	315K	349K
WIMP (Window, Icon, Mouse ...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232 Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	95
Numeric Keypad	NO	YES (16 Keys)	YES (18 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Syntheiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive

Price of basic system (exc VAT)	£2595+VAT	£595+VAT	£652+VAT
+ Mouse	Included	£95+VAT	Included
+ Monochrome Monitor	Included	£200+VAT	Included
+ Expansion to 512K RAM	Included	£295+VAT	Included
Price of complete system (exc VAT)	£2595+VAT	£1185+VAT	£652+VAT
PRICE rounded down including VAT	**£2,984**	**£1,362**	**£749**

PRESS COMMENT

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore where Mr. Tramiel established the maxim that 'Business is war'."
August 21st 1984 **FINANCIAL TIMES**

"This is the only personal computer I know of that comes with a Midi interface as standard."
Peter Bright March 1985 **PERSONAL COMPUTER WORLD**

"The (GEM) version running on the Atari 68000 machines will have the additional advantage of leaving the PC version standing."
April 6th 1985 **PERSONAL COMPUTER NEWS**

"It would seem that GEM offers the ideal operating system."
March 7th 1985 **POPULAR COMPUTING WEEKLY**

"I found it (GEM) extremely easy to use and was very impressed with the way in which it disguises the unfriendly hardware and operating systems lurking under the surface."
Peter Bright Feb 1985 **PERSONAL COMPUTER WORLD**

"The electronics in the machine are a work of art ... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip ... when the machine appears in the shops, I'll be at the front end of the queue to buy one."
Peter Bright June 1985 **PERSONAL COMPUTER WORLD**

"This machine is significantly more powerful than an IBM PC ... If it's possible to design a sure-fire winning machine, this is it."
May 11th 1985 **PERSONAL COMPUTER NEWS**

"... the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintoshes'."
May 2nd 1985 **COMPUTING**

"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying — easy-to-use computing power without the price."
March 1985 **ANALOG COMPUTING**

"It (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression."
May 23rd 1985 **POPULAR COMPUTING WEEKLY**

"The Atari ST is one of the most elegant designs I have seen ... Atari has used an original and elegant method of memory management which should make the ST faster than any other PC on the market - in any price bracket ... The 64K dollar question is would I go out and spend money for one? To which the only answer is "Try and stop me!"."
John Lambert July 1985 **ELECTRONICS & COMPUTING**

"The 520ST is technically excellent ... The 520ST hardware is the new standard by which others will be judged."
July 1985 **YOUR COMPUTER**

SILICA SHOP

WE ARE THE UK's No1 ATARI SPECIALISTS

At Silica we have been successfully dedicated to Atari ever since their products first appeared on the UK market. We can attribute our success largely to the Atari specialisation which we practice and to the user back-up we provide. Rest assured that when you buy a piece of Atari hardware at Silica you will be fully supported. Our mailings giving news of software releases and developments will keep you up to date with the Atari market and our technical support team and sales staff are at the end of the telephone line to deal with your problems and supply your every need. With our specialist bias, we aim to keep stocks of all the available Atari hardware, software, peripherals and accessories. We also stock a wide range of Atari dedicated books and through us, the owners on our list can subscribe to several American Atari dedicated magazines. We can provide a full service to all Atari owners and are now firmly established as the UK's NUMBER ONE Atari specialists. Here are just some of the things we can offer to our customers.

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SEND FOR FREE ATARI ST LITERATURE

To: Silica Shop Ltd, Dept CAGE 0186, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

PLEASE SEND ME FREE LITERATURE

ON THE NEW ATARI 520ST COMPUTER

Mr/Mrs/Ms: ..... Initials: ..... Surname: .....

Address: .....

Postcode: .....

Do you already own a computer
If so, which one do you own? .....